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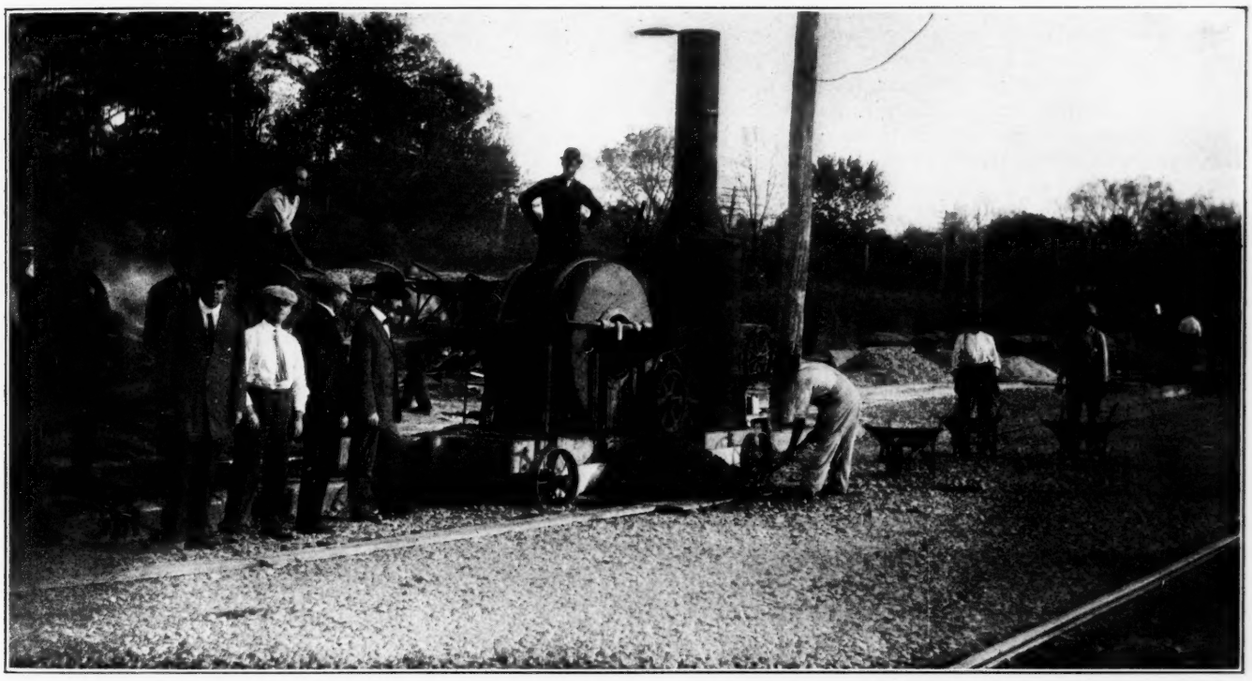


MIXING WITH STANDARD CONCRETE MIXER, SECTION NO. 5

THE BRONX EXPERIMENTAL ROAD

Methods of Laying and Cost of Each of Eighteen Sections—Conditions after Six Months' Use—Bituminous Pavements—Hand and Machine Mixing and Penetration Method

THE BRONX experimental road, laid by the Commissioner of Public Works, Borough of Bronx, New York City, a brief account of which was given in the MUNICIPAL JOURNAL, November 10, 1910, has now been subjected to traffic for about six months and some of the conclusions which it was the purpose of the construction to ascertain can already be drawn. The purpose of the laying of the eighteen kinds of pavement in a single continuous stretch was to ascertain what sort of construction would meet the needs of that part of the city and the cost of which would not bear so hard on property owners as would the standard types of pavement laid in the lower portions of the city. In fact, a legislative act was passed providing for the laying of pavements, temporary in character, the cost of which would be charged to property owners and credited to them later when a higher class pavement should be laid. In this respect the results were satisfactory and a number of the types of pavement laid experimentally will be constructed, perhaps in large areas, during the coming season.

The experimental pavements were laid on the White Plains road, a suburban thoroughfare leading to Mount Vernon and other cities. Sections of about 325 feet were laid of each pavement, the total length of the 18 kinds being 4,120 feet. The road is a wide one with two car tracks and the paved strip on the east side of the road is about 20 feet wide. A traffic census taken under the direction of William H. Connell, assistant commissioner of public works, who also was responsible for the laying of this experimental road and had charge of its construction, shows that about 300 vehicles a day used the road. The figures were doubtless correct, but on the day that the accompanying photographs were taken the traffic appeared to be much greater than this. The number of heavy two- and even four-horse loads using the road at that time gave it the

appearance of carrying what would generally be considered as a fairly heavy traffic. At any rate, the number of automobiles and heavy steel tired trucks was sufficient to severely test the wearing qualities of any type of construction. (Mr. Connell stated to the writer, since the above was written, that the traffic is now three times as heavy as in the fall, when the census was taken.)

There has been sufficient traffic to develop faults, if any of the sections were actual failures, but the general surface of the paved sections throughout is good. In most instances the surface is closing up well, indicating that the pavements will withstand winter conditions. Whether any of them will form waves in summer cannot as yet be foretold.

As regards costs, not many conclusions can be drawn, although a close examination of the items, with consideration of all the conditions, furnishes some comparative cost data. In general, the opinion of assistant commissioner Connell may be quoted. He gives it as his opinion that in work of considerable extent the costs would be from 20 to 30 per cent less than the actual cost of the experimental sections. It would hardly be fair, though, to assume that the ratios between costs of large work would be the same as those between these sections. The items of chance and management figure very largely in small pieces of work. The question of thickness of bituminous material is of the utmost importance in controlling costs. In small areas of work done in cold weather the material is laid thicker than under ordinary conditions when things are moving smoothly on a large job. A bituminous stone mixture weighs about 110 pounds per square yard one inch thick. A bituminous sand mixture weighs about 100 pounds per square yard one inch thick. These figures should be born in mind when examining the cost details and thickness of material used.

As regards conclusions to be drawn later, it should be borne in mind that the possible inferiority of any one of these pavements need not necessarily condemn it, if evidence favorable to it can be found elsewhere; for the mixture might be out of balance, be too rich or two dry, or have too much or too little fine material. However, as the work was all carefully done under expert supervision the presumption will naturally be that tests are fairly representative.

Two kinds of foundations were used on the Bronx experimental road—cement concrete and bituminous concrete. Each of these has advantages and disadvantages peculiar to itself. The bituminous concrete foundation has a great advantage in cost. About four inches of bituminous concrete cost about 30 cents on the average and 4½ inches of Portland cement concrete cost nearly 60 cents. On large work, with perhaps a half-inch reduction in thickness, it would seem that the concrete ought to be laid for about 40 or 45 cents, while the bituminous base could hardly be reduced below 25 cents even on a large job. As regards rigidity the concrete has the advantage. The pavements laid on the bituminous base in a number of instances show that the rolling settled the stone or pushed it out of place. This was partly due to an error in construction; a ten-ton tandem roller would have been better for this work than the heavier macadam rollers. This fact was appreciated at the time the work was going on, but it was impossible to obtain a tandem roller. The bituminous base, in spite of its cheapness, is, in the opinion of most asphalt experts, better in one respect than the concrete base (although the extent of the superiority has not been determined) in that the bitumen in the base stone acts as a reservoir of light bituminous oils, and as these disappear from the surface material by evaporation or disintegration their place is supplied by the oils from the base. This gives the surface coat a longer life than it has when laid on concrete. Moreover a surface might wave, due to lack of bond with the concrete, which would not slip on a bituminous base. On the other hand, when a pavement is cut into the repairs are most perfectly made if the base is of cement concrete. In this road, where both kinds of base are used, time may shed some light on this puzzling question.

The pavements of the experimental road can be classified into two general divisions according to the method of construction employed—the penetration and mixing methods. Three sections do not come in either class; they are cement concrete laid by the Hassam method, a section of plain water bound macadam and a strip of macadam with road oil poured over the surface. The sections of macadam, one treated with rod oil and the other not, are interesting as both of them at the present time show signs of disintegration, but each by different kinds of traffic. The difference in the wear caused by automobiles and by steel tires is coming to be clearly distinguished. Simple and economical methods of construction which will resist one kind of wear do not stand the other. Plain water bound macadam stands the wear of steel ties but ravels under automobile traffic. Macadam treated with oil will stand automobile traffic, but steel tired wheels cut it up. In the White Plains road, the plain macadam section shows signs of raveling; the oil treated section is badly cut up by steel tires.

The sections of pavement laid by the penetration method cost less than those laid by mixing methods. In general their appearance is excellent. In fact it is impossible to distinguish by superficial examination, with absolute certainty, between mixed and penetration pavements. Unquestionably, however, the difference is there, could be clearly seen by digging into the pavement, and will probably show in time in the lower cost of maintenance of the mixed materials. If there is any exception to this apparent equality it is in favor of the tar penetration pavements. On account of its slight viscosity when hot, tar mixes with the stone much better than does the more viscous asphalt. This makes it impossible to distinguish superficially between a tar penetration and a tar mixed roadway. As there is generally more tar in a poured than in a mixed pavement it is possible that this excess may outweigh in importance the imperfections in mixture of the former and that a tar penetration pavement may last as long as a tar mixed pavement. This is another undetermined factor which the Bronx experimental road may in time help to determine.

Among the samples of mixed bituminous pavements are some mixed by hand. The results both as regards cost and quality are such as almost to eliminate hand mixtures from practical consideration in work of any considerable extent. The ordinary plant charges on any piece of work of a mile or so in extent should not exceed 10 cents per square yard. The excess cost of hand mixtures over machine on this work was much more than that amount. In hand work the labor and fuel cost of heating is high and would not be reduced much on large work. Moreover an excess of asphalt is very apt to be used in hand work. If the stone is a little cold more asphalt has to be used to facilitate mixing, although there is probably no advantage in using the excessive quantity and there may be a disadvantage in that the mixture might be too soft in summer. At any rate machine mixed stuff is more uniform; whatever percentage of bitumen is believed to be desirable can be put in and properly mixed. Also more fine material can be used in machine mixed stuff and hence the pavement is firmer. These theoretical considerations can be confirmed by close inspection of the White Plains road on a hot day.

On one section of this road cold stone was used, the mixing being done by an ordinary concrete mixer. The economical results in this instance were very satisfactory. It was necessary, however, to omit the screenings from this mixture, but as a very viscous Texas asphalt was used, the result will very likely be satisfactory. Still it seems probable that somewhat better results might be obtained by heating the stone and adding some finer aggregate. Another section of the road was laid using the Sicilian Company's asphalts, which apparently is a sand mixture and looks very much like any asphalt pavement.

The pavement which is regarded by the city officials as the most satisfactory is No. 2, Bronx specifications for bituminous macadam mixture, laid on concrete, the surface mixture made in a plant. Owing to litigation over the Warren patents it is probable that this kind of pavement will not be laid during the coming season.

A considerable amount of pavement not exactly like any of the experimental sections probably will be laid to meet the requirements of the conditions created by the new law. This is simply a four-inch Portland cement foundation, over which will be laid 1½ or 2 inches of asphalt and sand mixed in accordance with ordinary specifications for standard asphalt pavements.

This leads up to a consideration of the merits of sand and stone for surface mixtures of bituminous pavements. It seems to be generally assumed that for road work stone is better than sand and doubtless it has advantages. There are however no published data proving that the stone mixture is more durable than the sand mixtures. As regards cost, the questions of thickness and percentages of bitumen, to say nothing of different relative costs of sand and stone in different localities, are so complicated that it cannot be stated definitely that one pavement is cheaper than the other. If it could be stated definitely what thickness of sand-bitumen mixture would wear as long, under the same traffic conditions, as a certain thickness of stone-bitument mixture, then the problem could be answered for any locality. Reliable data regarding this, however, do not exist. Perhaps the laying of experimental roads may in time supply the deficiency. If a bituminous stone base is sufficient to carry the traffic, the stone mixture has the advantage that it can be laid directly on the base and the result is a cheap pavement. If a concrete base is required, and an asphalt-stone binder used as in standard asphalt pavement, the cost runs up into high figures. If this binder be omitted, then the question as to durability of the pavement arises.

The photographs accompanying this article were taken of sections of the street located about 6 feet from the margin of the pavement. In all cases portions of the street were selected where no seal coat had been applied, as it is believed that the best idea of the texture of the pavement is obtained by photographing such sections. (In this connection it may be stated that, owing to the cold weather and high wind during construction the application of the seal coat was not as successful as it would have been in warm weather.) The method of taking the photographs was as follows: A 3-A folding pocket kodak was suspended between two tripods, resting firmly on the broad flat top of one of them. The lens of the camera was about 3½ feet from the pavement and a portrait lens was placed over the regular lens to secure proper focus. The opening in the lens was varied from 32 to 64 and the time of exposure was from a quarter of a second to a second, according to the varying light.

A detailed description of the 18 sections of the road and some of the items of cost follow.

Sections 1 to 10—Mixing Methods

SECTION 1

Bituminous Pavement Mixing Method Laid by the Barber Asphalt Company

Foundation Course—A concrete foundation was laid to a finished depth of 4½ inches in proportions of 1:3:6.

Surface Course of Paving Mixture—The paving mixture consists of the following mineral aggregate by weight: 73 per cent paving gravel, 19½ per cent sand, 1½ per cent dust and 5.4 per cent Bermudez asphalt, 55 penetration. The mixing was done at the Barber asphalt plant, then laid at a temperature of 220 degrees and rolled to a finished depth of 1¾ inches with a 10-ton roller.

Seal Coat—From 0+00 to 1+52, ¼ gallon of asphaltic cement to the square yard was applied, over which sand was spread.

Cost Per Square Yard

Concrete Foundation	$0.639
Surface Course	0.715
Seal Coat	0.085
	$1.439

COMPLETED SECTION OF WHITE PLAINS EXPERIMENTAL ROAD
Section No. 8 in foreground

The surface was laid by the Barber Asphalt Paving Company at a price agreed on.

The gravel used in the mixture was of a siliceous nature. Most of the pebbles on the surface appear to have been crushed by the roller. In some spots the gravel appears to have separated from the bitumen and fine material, having an excess of gravel, which shows some signs of ravelling, or breaking up. The general surface, however, is excellent.

SECTION 2

Bituminous Pavement Mixing Method Laid in Accordance with Borough of The Bronx Specifications

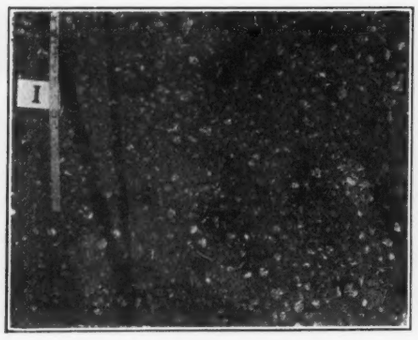
Foundation Course—1½-inch crushed trap rock was spread and thoroughly rolled with an 18-ton roller to a finished depth of about 3¾ inches.

Surface Course or Paving Mixture—The paving mixture is composed of two parts crushed trap rock passing through a 1¼-inch ring and not containing more than 5 per cent dust, 1 part sand and 7.4 per cent by weight of Bermudez asphalt, 55 penetration. The mixing was done at an asphalt plant and the paving mixture laid at a temperature of 220 degrees and rolled to a finished depth of 2½ inches with a 10-ton roller.

Seal Coat—From 3+25 to 4+78, ¼ gallon of asphaltic cement to the square yard was applied, over which chips were spread and rolled.

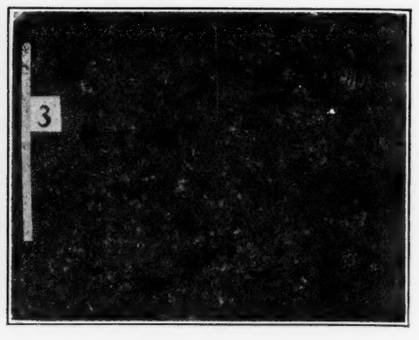
Cost Per Square Yard

Base Course	$0.283
Surface Course	0.751
Seal Coat	0.081
	$1.115



BARBER ASPHALT CO.

BRONX SPECIFICATIONS



BERMUDEZ, PLANT MIXED

Cost of Surface Course

	Total.	Per Sq. Yd.
Mixing at plant	$110.48	$0.144
Labor, Field	51.25	0.067
Hauling	93.84	0.122
Asphalt Cement, 1,600 gals., at $0.131.	209.60	0.273—2.09 gals. per sq. yd.
¾-inch Trap Rock, 54 cu. yds., at $1.25	67.50	0.088
Sand, 30½ cu. yds., at $0.75	22.87	0.030
Dust, 2,760 lbs., at $3.50	4.83	0.006
Grit, 3 cu. yds., at $1.25	3.75	0.005
Coal, 8,030 lbs., at $3.00	12.05	0.016
767 sq. yds. at $0.751	$576.17	$0.751
Weight of surface mixture per sq. yd.		290 pounds

This is an excellent section, and much similar work would have been done this year if it were not for litigation over patent rights.

SECTION 3

Foundation Course—A concrete base was laid under the supervision of C. I. Williams, of Utica, N. Y., to a finished depth of 4¾ inches, 1½-inch stone was spread to a depth of 6 inches; then screenings and cement mixed dry in proportions of 3-1 were spread, rolled, and sprinkled with water, the operation was repeated until the voids were filled. An eighteen-ton roller was used.

Paving Mixture or Surface Course—The paving mixture is composed of two (2) parts crushed trap rock passing through a 1¾-inch ring and not containing more than 5 per cent. dust, 1 part sand, and 8 per cent. Bermudez asphalt, 55 penetration. The mixing was done at an asphalt plant and the paving mixture was laid at a temperature of 220 degrees and rolled to a finished depth of 2 inches with a ten-ton roller.

SECTION 4

Bituminous Pavement Mixing Method Laid Under the Supervision of the Standard Oil Company

Foundation—1½-inch crushed trap rock was spread and thoroughly rolled with an eighteen-ton roller to a finished depth of about 3¾ inches.

Surface Course or Paving Mixture—The paving mixture consists of the following mineral aggregate by weight: 58 per cent. ¾-inch trap rock, 20 per cent. ⅜-inch chips, 15 per cent. sand and 7 per cent. Standard Oil Company special asphalt binder. The binder, trap rock and sand were heated on the ground and mixed by hand on mixing boards, the mixture was spread and rolled to a finished depth of 2¾ inches with an eighteen-ton roller.

Seal Coat—From 9+95 to 10×66, ⅓ gallon to the square yard was applied, over which chips were spread and rolled.

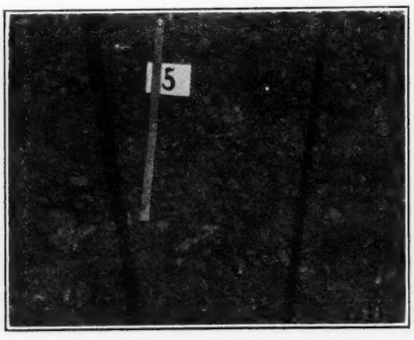
Cost Per Square Yard

Base Course	$0.283
Surface Course	0.964
Hauling Binder	0.009
Fuel	0.063
Asphalt and Stone Heaters	0.004
	$1.323

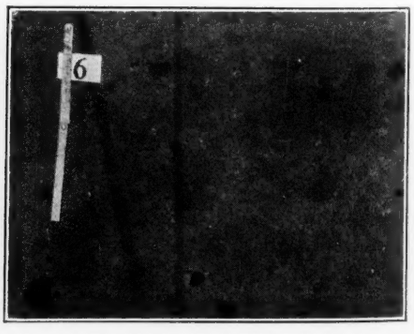
Cost of Surface Course

	Total.	Per Sq. Yd.
Labor	$368.14	$0.480
¾-in. Trap Rock, 60 cu. yds., at $1.80.	108.00	0.140
Chips, 18 cu. yds., at $1.90	34.20	0.045
Sand, 12 cu. yds., at $1.21	14.52	0.019
Binder, 2,688 gals., at $0.08	215.04	0.280—3.5 gals. per sq. yd.
767 sq. yds., at $0.964	$739.90	$0.964
Weight of surface mixture per sq. yd.		346 pounds

STANDARD OIL CO., HAND MIXED



TEXAS BINDER, MACHINE MIXED



AMIESITE

Seal Coat—The surface coat was painted with about ¼ of a gallon of asphaltic cement to the square yard, over which chips were spread and rolled.

Cost Per Square Yard

Concrete Foundation	$0.502
Surface Course	.90
Seal Coat	.08
	$1.482

Cost of Surface Course

	Total.	Per Sq. Yd.
Mixing at Plant	$105.14	$0.297
Labor, Field	32.06	0.090
Hauling	40.80	0.115
Asphalt Cement, 742.5 gals., at $0.13..	96.52	0.273—2.1 gals. per sq. yd.
Trap Rock, 22.5 cu. yds., at $1.25	28.12	0.079
Sand, 9.0 cu. yds., at $0.75	6.75	0.020
Dust, 1,440 lbs., at $3.50	2.52	0.008
Coal, Soft, 5,300 lbs., at $3.00	7.95	0.022
Coal, Hard, 400 lbs., at $6.00	1.20	0.003
354 sq. yds., at $0.907	$321.06	$0.907
Weight of surface mixture per sq. yd.		260 pounds

SECTION 5

Bituminous Pavement Mixing Method Laid Under the Supervision of the Texas Co.

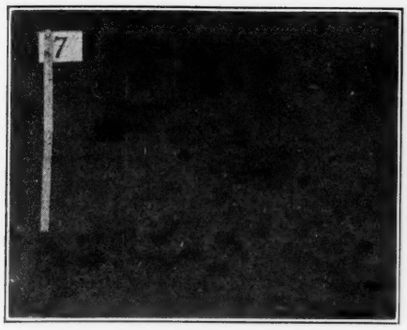
Foundation Course—1½-inch crushed trap rock was spread and thoroughly rolled with an eighteen-ton roller to a finished depth of about 3¾ inches.

Surface Course or Paving Mixture—The paving mixture consists of ¾-inch trap rock and 6.7 per cent by weight of Texas macadam binder. The binder was heated and mixed with the cold stone in a standard concrete mixer on the ground. The paving mixture was spread and rolled with an eighteen-ton roller to a finished depth of 2¾ inches.

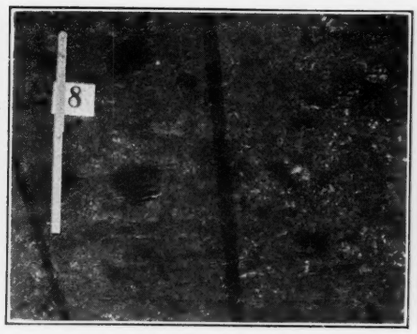
Seal Coat—From 12+36 to 13+03, a seal coat of Texas 55 special, about 1¼ gallons to the square yard, was applied, over which chips were spread and rolled.

Cost Per Square Yard

Base Course	$0.283
Surface Course	0.721
Tar Heater	0.001
Fuel	0.021
Hauling Binder	0.006
	$1.032



ASPHALTO, PLANT MIXED



TARVIA X, HAND MIXED

BERMUDEZ ASPHALT, HAND MIXED

This is one of the most interesting sections in the whole work. The stone shows plainly, owing to lack of fine material. The surface is extremly uniform throughout. The feeling of the pavement under the feet is distinctly soft or rubber-like, in spite of the fact that the stone shows on the surface more plainly than in any other asphalt-mixed section. Signs of wrinkling and cracking under the roller, perhaps due to soft foundation, are evident in places. A slight tendency in this direction may be noted near the foot of the ruler in the illustration No. 5.

Cost of Surface Course

	Total.	Per Sq. Yd.
Labor	$182.86	$0.234
¾-in. Trap Rock, 81 cu. yds., at $1.80	145.80	0.186
Binder, 1,728 gals., at $0.12	207.36	0.265—2.2 gals. per sq. yd.
Concrete Mixer (rent), 7 days, at $4.00	28.00	0.036
782 sq. yds. at $0.721	$564.02	$0.721

Weight of surface mixture per sq. yd.....300 pounds

SECTION 6

Amiesite Laid Under the Supervision of the Amiesite Co.

Foundation Course—1½-inch crushed trap rock and sufficient screenings to fill the voids was spread and rolled with an eighteen-ton roller to a finished depth of 3½ inches.

Surface Course of Paving Mixture—The paving mixture was shipped from the Amiesite plant and laid in two courses, the first course was composed of 1½-inch stone with binder, etc., laid and rolled to a finished depth of 2 inches. The second or wearing course was composed of ⅝-inch trap rock, binder, etc., laid and rolled to a finished depth of 1 inch. The paving mixture therefore had a finished depth of three inches. An eighteen-ton roller was used.

Surface is very close, hardly distinguishable from a standard asphalt surface, especially where travel has been heaviest.

SECTION 7

Sicilian Asphalt Laid by the Sicilian Asphalt Co.

Foundation Course—Consists of 1½-inch crushed trap rock laid and rolled with an eighteen-ton roller to a finished depth of 4½ inches.

Surface Course of Paving Mixture—The paving mixture is called Asphalto and was mixed at the Sicilian Asphalt Company's plant and hauled to White Plains avenue and spread. The paving mixture was not rolled until comparatively cool with a Sicilian asphalt ten-ton grooved roller, to a finished depth of 1½ inches. A light layer of cement was then sprinkled over the surface.

This is evidently a mixture containing sand and considerable fine dust. It is a secret but not a patented mixture. Spots in the illustration are oil dropped from automobiles.

SECTION 8

Bituminous Pavement Mixing Method Laid Under the Supervision of the Barrett Manufacturing Co.

Foundation Course—1½-inch crushed trap rock and screenings was spread and rolled with an eighteen-ton roller to a finished depth of 3¾ inches.

Surface Course or Paving Mixture—The paving mixture consists of 3 parts ¾-inch trap rock, 1 part chips and 6½ per cent. by weight of Tarvia X. The trap rock and Tarvia X were heated on the ground and mixed by hand on mixing boards, spread and rolled with an eighteen-ton roller to a finished depth of 2¾ inches.

Seal Coat—About .6 of a gallon to the square yard of Tarvia X was applied, over which chips were spread and rolled.

Cost Per Square Yard

Base Course	$0.305
Surface Course	0.913
Seal Coat	0.137
Hauling Binder	0.009
Tar and Stone Heaters	0.002
Fuel	0.063
	$1.429

Cost of Surface Course

	Total.	Per Sq. Yd.
Labor	$206.60	$0.421
1½-in. Trap Rock, 6 cu. yds., at $1.65	9.90	0.020
¾-in. Trap Rock, 43 cu. yds., at $1.80	77.40	0.157
Chips, 14 cu. yds., at $1.90	26.60	0.054
Binder, 1.344 gals., at $0.095	127.68	0.261—2.7 gals. per sq. yd.
491 sq. yds., at $0.913	$448.18	$0.913

Weight of surface mixture per sq. yd.....340 pounds

HAND MIXING ON SECTION NO. 4, WHITE PLAINS EXPERIMENTAL ROAD.

SECTION 9

Bituminous Pavement Mixing Method

Foundation Course—1½-inch crushed trap rock and screenings were spread and rolled to a finished depth of 3¾ inches.

Surface Course or Paving Mixture—From 22 + 75 to 23 + 02, the binder consists of a mixture, tar and 10 per cent. of refined Bermudez asphalt. From 23 + 02 to 24 + 00, the binder consists of a mixture of tar and 15 per cent. of Bermudez asphalt of 60 penetration. From 24 + 00 to 24 + 40, the binder consists of a mixture of tar and 15 per cent. of Bermudez asphalt of 110 penetration. From 24 + 40 to 24 + 50, Bermudez asphalt of 110 degrees penetration was used for a binder. The paving mixture consists of 3 parts ¾-inch trap rock, 1 part chips and 7 per cent. by weight of bitumen. The stone and binder were heated on the ground, mixed by hand on mixing boards, spread and rolled with an eighteen-ton roller to a finished depth of 2¾ inches.

Seal Coat—About .6 of a gallon of asphalt per square yard was applied, over which chips were spread and rolled.

Cost Per Square Yard

Base Course	$0.305
Surface Course	1.034
Seal Coat	0.146
Fuel	0.063
Hauling Binder	0.009
Tar and Stone Heaters	0.002
Mixing Binder	0.076
	$1.635

Sections 11-18 Penetration or Other Systems

SECTION 11

Barrett Manufacturing Co.'s "Modern Pavement"

Foundation Course—1½-inch crushed trap rock was spread and rolled to a finished depth of 3 inches.

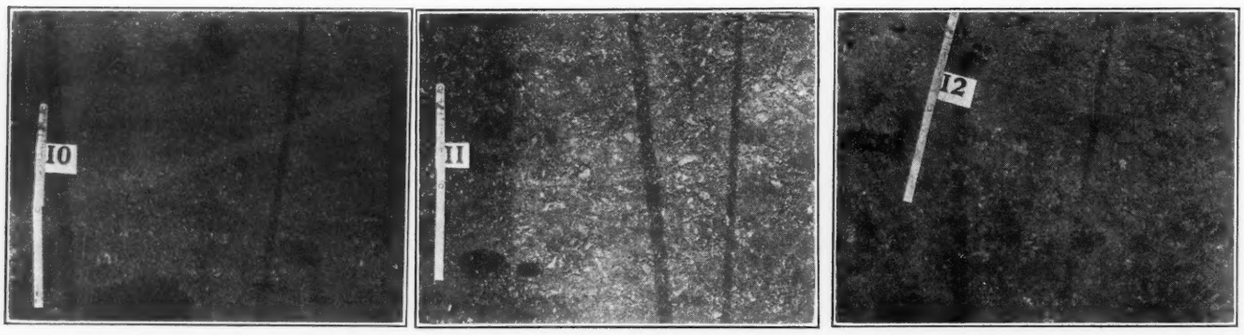
Surface Course or Paving Mixture.—A sufficient quantity of sand was spread to fill the voids and laid about ½ inch in thickness on top of the foundation course, over which about 1 gallon of Tarvia X to the square yard was applied. 1½-inch crushed trap rock was then spread and lightly rolled to a depth of 3 inches. About 2 gallons of Tarvia X to the square yard was then applied by the penetration method. A layer of ¾-inch stone was spread and rolled. An eighteen-ton roller was used.

Seal Coat—About 1 gallon to the square yard was applied, over which course sand was spread and rolled.

Cost Per Square Yard

Base Course	$0.305
Surface Course	0.698
Seal Coat	0.219
Hauling Binder	0.010
Tar Heater	0.003
Fuel	0.021
	$1.256

The presence of large stone in the mixture is apparent. They are firmly bound n place by finer material.



REFINED TAR, HAND MIXED BARRETT "MODERN PAVEMENT" PENETRATION METHOD

Cost of Surface Course

	Total.	Per Sq. Yd.
Labor	$197.84	$0.479
1½-in. Trap Rock, 5 cu. yds., at $1.65	8.25 }	0.181
¾-in. Trap Rock, 37 cu. yds., at $1.80	66.60 }	
Chips, 12 cu. yds., at $1.90	22.80	0.055
Binder, 1,115 gals., at $0.118	131.57	0.319—2.7 gals. per sq. yd.
413 sq. yds., at $1.034	$427.06	$1.034

Weight of surface mixture per sq. yd.....380 pounds

SECTION 10

Bituminous Pavement Mixing Method

Foundation Course—1½-inch crushed trap rock and screenings were spread and rolled to a finished depth of 3¾ inches.

Surface Course or Paving Mixture—The paving mixture consists of 3 parts ¾-inch trap rock, 1 part ⅜-inch trap rock chips and 6 per cent. by weight of refined tar. The binder and stone were heated on the ground and mixed by hand on mixing boards, spread and rolled with an eighteen-ton roller to a finished depth of 2¾ inches. The binder used was refined tar made up in accordance with specifications drawn up by the Office of Public Roads, U. S. Dept. of Agriculture.

Seal Coat—About .6 of a gallon to the square yard was applied, over which chips were spread and rolled.

Cost Per Square Yard

Base Course	$0.305
Surface Course	0.868
Seal Coat	0.135
Fuel	0.063
Hauling Binder	0.008
Tar and Stone Heaters	0.003
	$1.382

Cost of Surface Course

	Total.	Per Sq. Yd.
Labor	$308.91	$0.377
¾-in. Trap Rock, 82.5 cu. yds., at $1.80	148.50	0.181
Chips, 27.5 cu. yds., at $1.90	52.25	0.064
Binder, 2,016 gals., at $0.10	201.60	0.246—2.46 per sq. yd.
819 sq. yds., at $0.868	$711.26	$0.868

Weight of surface mixture per sq. yd.....380 pounds

SECTION 12

Bituminous Pavement Penetration Method

Foundation Course—1½-inch crushed trap rock and sufficient screenings to fill the voids was spread and rolled to a finished depth of 3½ inches.

Surface Course or Paving Mixture—1½-inch crushed trap rock was spread and lightly rolled to a depth of 2¾ inches. From 29 + 00 to 30 + 50 about 1½ gallons of Sanford & Strains ashpalt binder was applied and a layer of ¾-inch trap rock was spread and rolled. From 30 + 50 to 31 + 00, the Standard Oil Co.'s special binder was used.

Seal Coat—¾ of a gallon to the square yard was applied, over which coarse sand and chips were spread and rolled. An eighteen-ton roller was used.

Cost Per Square Yard

Base Course	$0.329
Surface Course	0.501
Seal Coat	0.123
Hauling Binder	0.006
Tar and Stone Heaters	0.003
Fuel	0.021
	$0.983

SECTION 13

Hassam Concrete Pavement

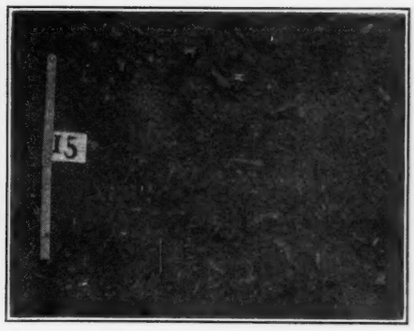
1½-inch trap rock (crushed) was laid and rolled with an eighteen-ton roller to a finished depth of 6 inches. Sand and cement were mixed in proportions of 1¾ sand to 1 of cement and forced into the voids of the stone by means of a special pressure machine used by the Hassam Paving Company.

	Total.	Per Sq. Yd.
Labor	$110.40	$0.234
1½-in. Trap (total) 111.6 cub. yds., at $1.65	184.14	0.390
Sand, 33.0 cu. yds., at $1.21	39.93	0.085
Cement, 535 bags, at $1.35 per barrel	180.56	0.382
Hauling Sand, Cement and Tools—		
6 teams, 80 hrs., at $0.625 per hr.	50.00 }	0.118
2 men, 20 hrs., at $0.28⅛ per hr.	5.62 }	
472 sq. yds., at $1.209	$570.65	$1.209

This section is cracked clear across in three places. The pavement seems harsh and noisy, but there is no indication of chipping or friability.

HASSAM CONCRETE

WATER-BOUND MACADAM



TARVIA, PENETRATION METHOD

SECTION 14

Water Bound Macadam

1½-inch crushed trap rock and sufficient screenings to fill the voids were spread, sprinkled and rolled with an eighteen-ton roller to a finished depth of 6 inches.

Cost Per Square Yard

	Total.	Per Sq. Yd.
Labor	$107.11	$0.303
1½-in. Trap Rock (total) 83.7 cu. yds., at $1.65	138.10	0.390
Screenings, 16.7 cu. yds., at $1.65	27.55	0.078
354 sq. yds., at $0.771	$272.76	$0.771

This section is very dusty. Signs of ravelling are apparent. Close inspection of the illustration shows this.

SECTION 15

Bituminous Pavement Penetration Method

Foundation Course—1½-inch crushed trap rock and screenings were spread and rolled to a finished depth of 3½ inches.

Surface Course or Paving Mixture—1½-inch crushed trap rock was spread and lightly rolled to a depth of 2½ inches. 2.3 gallons to the square yard of Tarvia was then applied, after which a layer of chips was spread and rolled.

Seal Coat—About ¾ of a gallon of Tarvia to the square yard was applied, over which chips was spread and rolled. An eighteen-ton roller was used.

Cost Per Square Yard

Base Course	$0.305
Surface Course and Seal Coat	0.735
Fuel	0.021
Hauling Binder	0.008
Tar Heater	0.002
	$1.071

SECTION 17

Bituminous Pavement Penetration Method

Surface and Base Course Spread in One Course—1½-inch crushed trap rock was spread and rolled to a depth of 6 inches. 1⅓ gallons to the square yard of Standard Oil Co.'s Binder "B" was then applied, over which a layer of ¾-inch trap rock was spread and rolled.

Seal Coat—1.1 gallon to the square yard of Binder "B" was applied, after which chips was spread and rolled. An eighteen-ton roller was used.

Cost Per Square Yard

Surface and Base Course	$0.648
Seal Coat	0.177
Fuel	0.021
Hauling Binder	0.006
Tar Heater	0.001
	$0.853

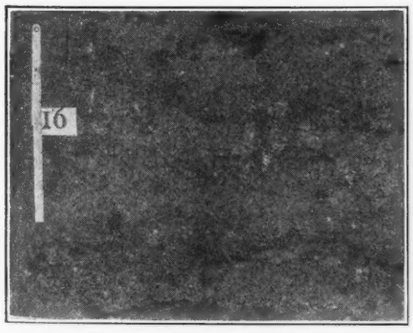
SECTION 18

Standard Oil Co.'s Sand Surface Method

Application of Oil and Sand—This was an old strip of water-bound macadam which was swept, after which ¾ gallon to the square yard of Standard Oil Co.'s Binder "A" was applied, over which sand was spread about one inch thick and lightly rolled.

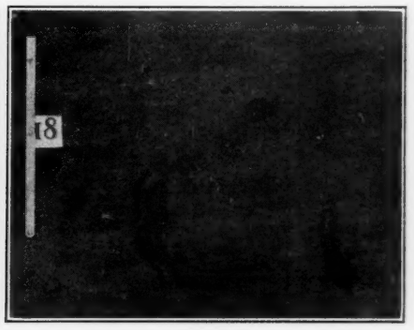
Cost Per Square Yard

Sand Course	$0.178
Hauling Binder	0.002
Tar Heater	0.001
Fuel	0.021
	$0.202



BERMUDEZ, PENETRATION METHOD

BINDER B, PENETRATION METHOD



SAND SURFACE METHOD

SECTION 16

Bituminous Pavement Penetration Method

Foundation Course—1½-inch crushed trap rock and screenings were spread and rolled to a finshed depth of 3½ inches.

Surface Course or Paving Mixture—1½-inch crushed trap rock was spread and slightly rolled to a depth of 3 inches. 1½ gallons to the square yard of Bermudez road asphalt was then applied, after which a layer of chips was spread and rolled.

Seal Coat—½ gallon to the square yard of Bermudez was applied, over which chips was spread and rolled. An eighteen-ton roller was used.

Cost Per Square Yard

Base Course	$0.305
Surface Course	0.519
Seal Coat	0.123
Hauling Binder	0.005
Tar Heaters	0.002
Fuel	0.021
	$0.975

Marks of horse's shoes show plainly in the illustration. In the more heavily traveled portion of the road the bituminous layer has been picked up, rolled about and is a bad mess. Travel is too heavy for this class of work.

A comparison of the accompanying photographs with the reproductions of the surfaces of the Ohio experimental road published in the MUNICIPAL JOURNAL January 4, 1911, will show that the stone in the Bronx road is not so plainly evident. In the latter the large stones in those mixtures which contain them—many of the mixtures have no stones larger than ¾ inch—are more completely bound in with bitumen and fine material. This more complete binding is a merit in itself, if the pavements are not too soft in summer. An additional reason why the stone does not show so plainly in the Bronx work is that the color of the trap rock in this is dark gray, making it inconspicuous as compared with the light colored Ohio stones.

SPECIFICATIONS FOR MICHIGAN HIGHWAYS

Construction Necessary for Receiving State Reward—Specifications for Clay-Gravel, Gravel, Stone-Gravel, Gravel-Stone and Stone Roads—Why Gravel Roads Are Popular—Care of Clay and of Sand Roads

The laws of 1909 of the state of Michigan provide for a payment or "reward" by the state to townships for roads built by them which conform to certain requirements. The state department has set forth plainly what these requirements are, and in its 1910 report has also given specifications for roads using the various local materials found within the state. It is required that roads to receive state reward should be well graded, that the steepest grade should not exceed 6 per cent and that the width should not be less than 18 feet between side ditches; that it shall be properly drained and have a wagonway or travel track not less than 9 feet wide. It is also provided that both shoulders and metaled track be properly crowned so as to shed water quickly to the side ditches. Such roads if of sand-clay and gravel receive a state reward of $250 a mile. Two-layer gravel roads receive $500 a mile. A layer of broken stone covered with a top course of gravel receives $750 a mile. A bottom course of gravel or slag and a top course of crushed stone receives $750 a mile. Two-course macadam received $1,000 a mile. Not more than two miles in any one township will be granted a reward in one year.

The clauses of the specifications for grading, drainage and shoulders are common to all roads and provide that the finished road should be not less than 18 feet between side ditches and have a cross section oval in form, with an average rise of one inch to the foot from the inner edge of the ditch to the center line of the road. The Highway Department recommends that for heavily traveled roads the distance between ditches be made at least 20 feet. The side ditches are to have sufficient incline to cause a free and uniform flow of water to the nearest natural outlets, which outlets must be so improved, where necessary, as to carry the water quickly away from the highway.

Shoulders of suitable material are to be formed not less than nine feet apart and extend to the side ditches or gutters at the same grade and curvature as required for the finished road. Where the road grade is high the shoulders may be formed by moving earth from the center of the present road grade to the sides, or, if the grade is low, by crowning the present road grade by scraping earth from the sides toward the center; or, if sufficient suitable material cannot be had along the roadway, it can be brought from other places. The bed thus formed must be crowned to conform to the grade and section of the finished road and 8 inches below the finished surface.

Clay-Gravel

A good quality of clay is then to be spread upon the road to a uniform depth of 3 inches and rolled sufficiently to crush the lumps, if there are any, and then harrowed until thoroughly pulverized. Immediately after harrowing, three inches of sand, which may be scraped from the sides with the scraping grader, should be spread upon the clay and carefully leveled. The road must then be harrowed again (a disc harrow is preferable) until the sand is uniformly covered with the clay, when the road will again be rolled until thoroughly compacted and hard, and everywhere five inches below the grade and section of the completed road. This mixing can be done much better when the clay is thoroughly wet.

The clay course is then covered with a layer of gravel of such thickness as will make a uniform depth of five inches after compacting, or six inches loose measure. The gravel must be clean bank gravel, not less than 60 per cent by weight of which should be pebbles retained on a screen of ⅛ inch and passing a screen of 1½ inch mesh. The gravel should contain not more than 20 per cent of clay, otherwise it will form mud. The gravel course is then harrowed with a spike-tooth harrow and rolled until no further compacting is possible; the final rolling being done while the road is well wet from sprinkling it after rains. Any hollows which may develop during rolling must be filled with the same kind of gravel, and the road kept properly crowned with a grader or drag and the rolling continued until the entire surface is uniform and hard and everywhere conforms to the proposed grade and cross section.

Rolling must at all times begin at the sides of the road, rolling lengthwise but gradually working toward the center. The shoulders are to be smoothed where necessary so that the whole roadway shall be in good surface and so that water will flow from it into the side ditches without obstruction.

Gravel Roads

The inner slope of the side ditches must be not steeper than 2 horizontal to one vertical and the outer slope not steeper than 1½ horizontal to one vertical. In clay soils trenches must be cut through the shoulders to furnish outlets into the side ditches for water that may collect in the gravel bed during construction and afterward before the surface becomes hard and waterproof. These trenches must be not more than 100 feet apart, must be 8 inches or more in width and slightly deeper than the gravel bed, and filled with coarse gravel when the first layer of gravel is being applied.

The sub-grade and shoulders are to be formed as provided for clay gravel roads. The sub-grade is then to be rolled, any hollows developing being filled with suitable material and rolling continued until the sub-grade is firm and everywhere parallel to the finished roadway and eight inches lower. A layer of gravel is then spread 6 inches deep (compacting to five inches); this gravel being good, clean bank gravel, not less than 60 per cent by weight of which is pebbles retained on a screen of ⅛-inch mesh and passing a screen of 2½-inch mesh. There should be no more than enough clay to coat the pebbles—no free lumps. This gravel is to be harrowed with a spike-tooth harrow and rolled until no further compacting is possible; this rolling being done only when the gravel is thoroughly wet. Depressions should be filled with the same material and rolling continued until the surface is uniformly smooth and hard and three inches below the finished surface.

The top course consists of clean gravel 60 per cent of which is retained on a ⅛-inch mesh and passes a 1½-inch mesh screen. This is spread about four inches thick (compacting to three inches) and is harrowed and rolled to a smooth hard surface. The rolling is to be done as specified for clay-gravel roads. It may be done with a power roller, a heavy horse roller, a traction engine followed by a weighted field roller, or by a weighted field roller alone if one of suitable strength to bear weighting to three or more tons can be obtained.

Stone-Gravel Roads

These are prepared as to grading, drainage and side shoulders as for gravel roads. Then crushed stone or slag is spread to a uniform thickness of five inches (compacting to four inches); this being either crushed clag, limestone, cobbles or trap rock which has passed over the ¾-inch section and through the 3-inch section of the crusher screen. Care should be taken to prevent the stone segregating, but the different sizes should be kept well mixed.

The stone or slag is to be rolled two or three times with a roller weighing not less than ten tons, after which it is to be covered to a uniform depth of from ½ to ¾ inch with stone screenings or bank gravel, the amount of this binder being somewhat less than enough to fill the voids. This is then to be rolled, water being used sparingly, if it seems desirable, and the rolling continued until the binder is worked into the crevices of the larger stones and the stones cease to sink or creep beneath the roller. Stone screenings, which are preferable to gravel, may be that part of the crusher product passing through the ¾-inch section of the crusher screen. The gravel, if used, should be similar to that specified for top course of gravel road.

On the lower course will then be placed a layer of gravel four inches thick, to compress to three inches, this being similar to the gravel specified for the top course of gravel roads. This course is to be floated until the surface is smooth and even, then sprinkled and rolled until no further contracting is possible. Any hollows that may develop in the gravel top during the process of rolling are to be filled with the same kind of gravel and the rolling continued until the surface is uniform and hard, and everywhere conforms to the proposed grade and cross section of the road. The manner of rolling is that prescribed for the top course of other roads.

GRAVEL-STONE ROADS

The grading, drainage, shoulders, sub-grade and lower course of gravel are as specified for gravel roads. Instead of gravel, slag may be used for the lower course, this consisting only of that part of the crusher product passing over the one-inch section and through the three-inch section of the crusher screen; the slag being bonded with gravel or stone screenings smaller than one inch, and then being sprinkled and rolled.

On this is to be placed a layer of crushed stone 4 inches thick, to compress to 3 inches, the stone being crushed limestone, cobbles or trap rock, using only that part of the crusher product which passes over the ¾-inch section and through the 2-inch section of the crusher screen. This stone must be placed on the road uniformly mixed, with no patches of alternately large and small stones. After this has been spread and rolled two or three times with a roller weighing not less than ten tons it is to be covered with ¾ inch of stone screenings. Enough screenings which have passed the ¾-inch section of the crusher screen should be used to slightly more than fill the voids in the larger stones. Water is then to be applied with a horse sprinkler and the road rolled and watered until it becomes so hard that a piece of rock will crush beneath the roller before penetrating the surface. If depressions are formed they should be filled with the smaller stones of suitable grade and not with screenings. More screenings must be added, however, wherever these disappear from the surface in the road.

STONE ROADS

After grading the road and preparing the ditches, shoulders and sub-grade as previously, the first course is composed of a layer of crushed stone 4½ inches deep, loose measure, to compress to 3½ inches; which stone may be crushed limestone, cobbles or trap which has passed over the ¾-inch section and through the 3-inch section of the crusher screen. This is then to be rolled two or three times and covered to a uniform depth of ½ to ¾ inch with stone screenings and re-rolled; the amount of screenings being somewhat less than enough to fill the voids in the stone. The rolling must continue until the binder is worked into the crevices of the larger stones and the stones cease to sink or creep beneath the roller. The top course will then be laid as specified for the top course of gravel-stone roads, except that the stone is placed 3½ inches deep instead of 4 inches, and compressed to 2½ inches instead of 3 inches. Binder is applied and the road rolled as previously specified.

About 7,000 miles, or approximately one-tenth of the total road mileage of Michigan, is surfaced with gravel. Since the state reward road law became operative there have been built about 350 miles of gravel roads approved by the Highway Department, which roads have cost ordinarily from $1,000 to $3,000 per mile. Gravel roads are popular in Michigan because they are durable and satisfactory; because they are easily built and easily repaired, requiring no expensive machinery; because the first cost is low; because they draw a relatively large state reward—frequently one-third or more of their cost; and because they are a labor proposition from start to finish and keep at home all the money spent in their construction.

In his annual report the highway commissioner gives instruction for the improvement or maintenance of unimproved sand roads, in which he states that moisture should be conserved in every way possible, especially by the liberal planting of shade trees, particularly on the south and west sides of the roadway. Temporary relief can be had by covering the roadway with straw, sawdust, shavings, cedar bark, leaves or almost any kind of vegetable matter. Such material forms a temporary covering which wheels cannot easily cut through, and conserves the moisture. Frequent scraping of sand roads with a road grader or other scraper is not only a loss of time and money, but is a positive injury, as it only helps the wheels to cut into it that much deeper. In short, except for the application of vegetable matter, as above suggesed, a sand road is best left to care for itself until it can be covered with clay, gravel or macadam.

In caring for clay roads or any soil which will pack under travel and become reasonably firm in dry weather, they should be properly crowned and thoroughly drained, even to the extent of using tile drains to remove ground water. After having been drained and graded and crowned, the log drag or plank float is sufficient to keep them in good condition. The drag should be used in the spring when the frost has left the ground and the road has begun to dry out but is still muddy. It should also be used after every prolonged rain throughout the season, and in the fall just before the ground freezes. Also if the frost should leave the ground at any time during the winter advantage should be taken of this to use the drag to smooth out the ruts.

ROAD WORK IN MASSACHUSETTS

Surface Treatment Recommended for Light Traffic—Heavy Oils Heated for Surface Preservation—Oil and Sand "Building-Up" Process

DURING the year 1910 the Massachusetts Highway Commission built 54.5 miles of road, 18 of which was waterbound macadam, about 15 was gravel with the top course bound with bituminous material, 7 was sand bound with oil, 6 was gravel, and 2½ was bituminous macadam with a surface binder of asphaltic oil.

Nearly a half million dollars was spent in maintenance of roads, including oiling. Many miles of roads have been successfully maintained in the last two years by a surface treatment of tar or asphaltic oil and Commissioner Parker and Chief Engineer A. W. Dean believe that this method of treatment will keep the roads in good condition where traffic is light. But without some such treatment many of the macadam roads are found to go to pieces in less than a year. It is believed therefore that bituminous surface treatment will be necessary over a large percentage of the State roads. This treatment costs from $500 to $1,200 per mile, depending upon the width of roadway treated and the condition of the road, and the length of haul for both bituminous material and metal. During 1910 more than 1,300,000 gallons of various tars, tarvias and asphaltic oils were used in maintenance and contsruction on about 250 miles of road. Of this length 219 miles was given a bituminous surface coat, and a bituminous binder was used in the top surface of 30 miles.

One method adopted by the Commission for using asphaltic oils was to heat sand or gravel, mix it with the oil and spread it upon a road which had been prepared by shaping and rolling. In other cases the so-called "building up" process has been used, in which the oil is heated before being applied and then about ¾-gallon per square yard is applied to the dressed surface of the road and is covered with as much sand as is required to absorb all the oil. Another coating of the same amount is then applied and this again covered with sand. It seems to be difficult to secure perfect uniformity in this work, probably because of uneven distribution of the oil, and holes or irregularities appear in the surface which make it necessary to reshape the road, in places adding more oil and sand and rolling the whole to a firm surface again. This reshaping is usually left for the second season. This method has enabled the commission to prepare a fairly satisfactory road at a much less cost than that of a stone or gravel road, especially where such materials are not to be found near by. Where travel is light and gravel or stone can be obtained only by long hauls, a

built-up road costs only one-half to one-third as much as a macadam, and can be shaped from time to time with less difficulty than can a clay road, and will give quite satisfactory service. The same method of construction has also been found to give excellent results where gravel which is obtainable is of a loose and sandy nature and does not cement together readily. The oldest road of this construction was one built in Eastham in 1905. Ruts have occasionally developed in this road and holes worn in the top surface, but it has been reshaped from time to time by harrowing, scraping and rolling and each year has improved in condition, the asphaltic oil seeming to retain its adhesiveness. The cost of this road for the five years has been about 17 cents for original construction and 19½ cents for maintenance, or a total cost of $3,400 per mile 16 feet wide. The commission in its report pays special attention to this class of road because it will enable localities where either absence or suitable material or lightness of travel make a macadam road too expensive to provide a fairly satisfactory road at much less cost.

The commission believes from its experience that the surface application of oil is to be recommended for dust suppression, but that to preserve the surface from wear a heavy bituminous material should be used and heated before application. It is found that where this material contains a large percentage of asphalt all the dust and dirt should be thoroughly removed from the surface of the road before application and the stones should not be extremely dry but should be rather moist, otherwise the oil will not adhere to the road metal. Two coats of one-quarter gallon per square yard each will produce more uniform and durable results than one coat of one-half gallon. A few days should elapse between the two applications. The commission has tested some English machines for distributing oil under pressure and believes that, while the penetration is not increased to any great extent by their use, the distribution is much more uniform, and it prefers this method to allowing the oil to flow on by gravity.

Most of the oil used last year by the commission was purchased under the following specifications:

The oil should be of a uniform color, appearance, general character and viscosity and must fulfill the following requirements:

a. It shall have a specific gravity of at least 0.97.

c. It shall contain not over 0.5 per cent of dirt or adventitious mineral matter.

d. It shall contain not over one per cent of matter insoluble in carbon bisulphide.

e. It shall be of such viscosity that 60 c.c. measured at room temperature (78 deg. Fahr.) shall when at 100 deg. C. be not less than 250 seconds nor more than 500 seconds in passing a Lawrence viscosimeter, or 200 c.c. measured and tested at the same temperature shall not be less than 900 seconds nor more than 1800 seconds in passing the Engler viscosimeter.

f. When 20 grams are heated in a flat-bottomed dish 3 inches in diameter for 21 hours in a well-ventilated oven kept at a temperature of 250 deg. C. the loss in weight shall not be greater than 15 per cent.

g. When subjected to a number of heatings at 250 deg. C. in a well-ventilated oven with intermediate separations of asphaltine and matter insoluble in carbon bisulphide until the final petroleum ether extract is not more than 10 per cent by weight of the original sample, it shall show the following results, assuming also that this final 10 per cent has the same composition as the 90 per cent of the material examined:

The total loss shall not be more than 35 per cent by weight; the amount of asphaltine in the original sample shall not be greater than 6 per cent by weight, and the amount of asphaltine formed by this treatment plus that in the original samples shall be at least 58 per cent by weight of the original sample. The amount of matter insoluble in carbon bisulphide as a result of this treatment shall not be greater than 5 per cent.

In applying oil the commission always treats one side of the road, and leaves the other untreated and open for traffic until the first has absorbed the oil and been put in such shape for traffic that the oil will not track or be objectionable in any way. While this commission has been systematically experimenting and noting results for a number of years, it is not confident that it or any one else either in this country or abroad can state with certainty what the final results will be from the adoption of these comparatively new methods of treatment. It appears probable, however, that the cost of maintenance where these bituminous methods are employed will be no greater with the heavy automobile traffic than is the cost of maintaining water-bound macadam. It has been found both in United States and in England and on the continent that it costs from $250 to $600 per mile per year to properly maintain a macadam road in country districts and considerably more where the traffic is heavy.

OHIO STATE ROAD LABORATORY

THE State Highway Department of Ohio, James C. Wonders commissioner, has a laboratory for testing road building materials which, while it is hampered by a small appropriation, is still a very creditable one. The equipment of the laboratory comprises a standard brick rattler, a Deval abrasion machine of four cylinders, Case jaw crusher, Ilers disc pulverizer, each of the above with its own motor. Also a stone shaker; diamond core drill; Page diamond saw; carborundum wheel grinder, with motor; Dorry grinding machine for hardness, with motor; sifter, with motor; hydraulic briquette molding machine; standard impact testing machine for toughness; trip-hammer model motor machine for cementing value; drying oven; scales, etc. The apparatus for cement testing consists of Riehle briquette machine, Vicat needle, Gilmore needles, gang molds, damp closet, specific gravity flasks, sand scales, etc. That for bituminous materials: One analytical balance, one New York testing laboratory penetrometer, one Engler viscosimeter, one Westpals specific gravity balance, one electric oven, one sheet steel asphalt heater and mixer, brass mold and asphalt flow plates, one closed flash tester, three hydrometers, four thermometers, three dissicators, and accessories such as platinum and porcelain crucibles, flasks, graduates, funnels, piquettes, etc.

The tests made for brick are the abrasion or rattler test, and that for absorption. The stone is tested for abrasion, hardness, toughness, slaking, cementing value, absorption and specific gravity. In testing cement the specific gravity, fineness, setting qualities, soundness and tensile strength are ascertained. The tests for bituminous materials are for specific gravity, water-soluble material, viscosity at 25 degrees C. and 100 degrees C., loss on heating five hours at 170 degrees C., loss on heating five hours at 205 degrees C., penetration of residue (from above evaporations), melting point of normal material, melting point of residue (from above evaporations), fixed carbon, ash, solubility in carbon disulphide, solubility in carbon tetrachloride, solubility in naphtha, percentage of paraffine scale present, fire point, percentage of coke left upon distillation, and special tests.

MISSOURI'S DIVERSIFIED ROADS

WHILE most of the roads in New England are of hard rock macadam, many of those in the Carolinas are of sand clay and most of the States or sections have their own peculiar kind of road, depending upon the geological features. Missouri, for the same reason, has adopted many kinds of roads in different sections of the State: sand, clay, gumbo, chert, gravel and different kinds of rock being the different materials available. Among the rocks used is the so-called "silica," which is a local name for a rotten rock running high in silica found in Cape Girardeau county and vicinity and which makes excellent roads for light or medium travel. Chert, gravel and rock are found in Green county, and each of these is used where most accessible. Convicts furnish the labor to a large extent, especially on the stone macadam roads. In St. Louis county most of the roads are macadam or Telford macadam. There are hundreds of miles of river bottom lands where sand and gumbo mixed seem to be the only practicable road material, and excellent roads for farm wagons have been constructed with them on the principle of the sand clay roads.

STREET WORK IN MADISON, WIS.

Tar Bound Macadam Petitioned for—Protecting Gutters while Applying Oil—Oiling Lessens Cost of Cleaning Catch Basins

DURING the year 1910, in the city of Madison, Wis., the citizens on at least two streets were so desirous of obtaining a street paving in front of their property which would be less dusty than the ordinary macadam, that they petitioned that the contracts for ordinary macadam, which had already been let, be changed so as to provide for using bituminous binder in the upper two inches, offering to stand the additional expense involved. In one of these, tar was used as a binder and in the other, asphalt. City Engineer John F. Icke says in his report: "The contractor took particular pains to get a good job and as a result we have the best tar-bound macadam thus far built in the city." The additional cost of the tar over the original contract price for water-bound macadam was about 28½ cents per square yard. We imagine that this would probably have been less if it had not been added as an extra to the original contract, this being the common experience as to extras in most cases.

The contracts for asphalt pavement last year provided for a five-year guarantee period and the retention of 10 per cent of the contract price as a guarantee, the company receiving 4 per cent interest on the money so retained. Concerning this Mr. Icke says, "I think the provision in the contract for the retention of a definite sum of money is a wholesome one and far superior to the guarantee of any surety company, especially in the matter of getting good results when it becomes necessary to make any repairs under the guarantee."

Street trees are now planted as a part of the permanent street work, in certain cases, at least. On West Washington Avenue are trees which have been in during three seasons, and owing to the efforts of the Park Department nearly all interfering trees on this street have been removed and in a few years the avenue will present an object lesson in the shape of a continuous arch of elm trees throughout the length so planted.

In 1910 oil was tried for the first time in Madison as a dust layer on macadam roads. It was purchased in tank-car lots at 4¼ cents per gallon, F. O. B. Madison. Any depressions were filled with crushed stone and rolled with the steam roller about a month before the oil was applied. The best results were obtained on streets where the macadam was in good condition or on those washed clean after a heavy rain. One idea which we believe is not common but which would seem worthy of trial elsewhere, was that of cleaning the surface of the macadam by sweeping all the dust into the gutter, where it was left until after the oil had been applied. The dust thus served to protect the curb from disfigurement by the oil and also to absorb that which flowed into the gutter, thus avoiding the unsightly and unpleasant pools of oil so frequently found along the sides of freshly oiled roads. In some cases the sweepings were thrown back onto the road, while in others they were removed from the gutters after the oil had stopped running off the surface. The tank cars were placed on a siding, which is on an embankment, thus making it possible to unload the oil from the tank cars into the oil sprinkling wagon by gravity. The oil was heated to about 150 degrees before being run out of the tank cars, this being effected by steam supplied by a traction engine owned by the city, which was run along side of the tank car and connected with it.

Concerning the use of oil the city engineer's annual report says:

"The short time that we have used oil on our macadam has shown how effective it is as a dust layer and as a protector to our macadam. One of the heaviest rains last season followed shortly after we had applied some of the oil. The rain did nothing more than to wash the oiled surface clean, but along the edges of the gutter and on the streets where no oil had been applied, the screenings were washed away, exposing the crushed stone.

"The cost of cleaning catch basins on the oiled streets has been materially lessened, as the rains no longer can erode the macadam and wash it into the basins. The heavy demand upon the water works system during the sprinkling season will be decreased materially, which in itself will be a great benefit.

"In order to get the best results we have learned that the macadam should be swept thoroughly, exposing the sharp edges of the stone; that the oil should be applied in warm weather; that traffic should be kept off from the streets until the oil has been practically all absorbed; that the gutters should be well covered with screenings to prevent the oil from spreading over them and soiling them."

ROAD IMPROVEMENTS IN WEST VIRGINIA

A State Department of Public Roads was created in West Virginia in 1909. The first work of the commissioner was to hold public meetings in order to inform the people concerning the aims of the department and to arouse interest in its work. It was also necessary to prepare standards for maps, plans, contracts and specifications; also to aid the county road engineers in systematizing their work and improving the standard of maintenance, at the same time reducing the cost. A meeting of the county road engineers was held in December, 1909, at which more than forty counties were represented. Previous to this it had been decided to establish the standard scale for county maps at 4,000 feet to the inch, these to show the districts, important towns, railroads, streams and all public roads. In addition standard plans are provided for having a scale of 100 feet to the inch for recording surveys of public roads.

OLD AND IMPROVED ROADS IN WEST VIRGINIA

The law of 1909 required each county to appoint a road engineer, and so far only one county has not met this requirement. By the end of 1910 2,454 miles of county roads had been surveyed, 12,371 miles had been measured, and maps had been made of 18 counties.

In addition to this preliminary work some actual road improvement has been performed. The accompanying illustration, showing a section of the original road running off to the left, gives a good idea of the necessity for improving both the grades of the roads and the general character of the same in many of the mountain districts of this State.

An idea of the preliminary construction work being done may be given by the report for Fayette county. This county has an area of 730 square miles and contains about 933 miles of public roads. "The roads in Fayette are being completely overhauled, consisting of cutting the brush and weeds, blasting out the ridges of rock that cross the roads in so many places, opening up good side ditches and crowning the roads well, so they can be maintained with the road drag. Seven miles radiating from Fayetteville are being worked with convicts at a cost of $25 per mile, and 475 miles have been let by contract at an average cost of $75 per mile. The remainder of the roads are being kept up by the supervisors working under the county road engineer. Three and a half miles of road will be constructed with convicts. The maximum grade of the present road is 16¾ per cent and the maximum grade of the new road will be 5 per cent."

OIL MACADAM SPECIFICATIONS

WE have received from J. B. Marcellus, of Boise, Idaho, the tabulation given below of the principal items of the specifications for oil macadam pavement used by several California cities, the State of New Jersey and the City of Boise. In some respects the several specifications are seen to be very similar, but in others quite dissimilar. The placing of the pavement upon rolled earth as a foundation is quite common, and the use of a ten-ton roller for rolling. The thickness of the pavement, however, varies from ¾ inch to 7 inches. The size of material used in the top stone varies from between dust and ½ inch as a minimum, to from ½ to 1½ inches as a maximum. The total amount of oil used per square yard also is quite variable, the maximum being ¾ gallon and the minimum 3½ gallons. Asphalt oil, 70% to 90%, is required by all except the New Jersey specifications. The other similarities and differences are quite apparent from an inspection of the table.

COMPARISON OF CERTAIN SPECIFICATIONS FOR OIL MACADAM PAVEMENT

City.	Foundation.	Roller.	Final Thickness of Pavement	First Course.		Second Course.		Top Course.	
				Size Stone.	Thickness.	Size Stone.	Thickness.	Size Stone.	Thickne s.
Long Beach	Rolled Earth	10 ton	5″	¾″ to 3″	2½″	¾″ to 2″	2″	¼″ to ¾″	½″
Los Angeles	Rolled Earth	10 ton	According to amount of traffic.	1½″ to 3″	..	¾″ to 1½″	..	¼″ to ¾″	..
San Monica	Earth mixed with oil—3 mixings.	250 lbs. per in.	2″ to 4″ of gravel	(See Foundation)		Dust to 1″	1½″	Dust to ½″	½″
Berkerly	Rolled Earth	250 lbs. per in.	¾″	Earth subgrade raveled with harrow then ¾″ layer of ¾″ gravel.		..	..	0″ to ½″	½″
Santa Barbara	Rolled Earth	10 ton	5″ at gutter 7″ at crown	1½″ to 2½″ with screenings	3″ (gutter) 5″ (crown)	..	..	½″ to 1½″ and screenings	2″ (gutter) 3″ (crown)
Bakersfield	Rolled Earth	10 ton	2″ at gutter 3½″ at crown	Earth pulverized for 6″ below gravel.		½″ to 3″	2″ (gutter) 3½″ (crown)	½″ pea gravel	..
Sacramento	Rolled Earth	300 lbs. per in.	6″	1¼″-2½″ with screening and water	4″	¾″-1½″ with screenings and water	2″	Screenings and sand to fill voids.	
New Jersey (state)	Rolled Earth	10 ton	..	2″ to 3″ with screenings	..	1″ to 2″ with sand to fill 50% of voids	..	¾″ 50% Dust 50%	..
Boise	Rolled Earth	10 ton	6″	1¼″ to 2½″ with screenings and water	4″	¾″ to 1¼″ with screenings and water	1½″	¼″ to ¾″ with screenings and water	½″

COMPARISON OF CERTAIN SPECIFICATIONS FOR OIL MACADAM PAVEMENT—(Continued)

City.	Oil.				Amount Rolling.	Remarks.
	Temp.	Character.	Total Amount.	How Applied.		
Long Beach	+175°	90% asphalt S.G. 10°-11° B.	1½ gal. per sq. yd.	1 gal. on 2nd course ½ gal. on top course	Unyielding Sprinkle each course	Lay undisturbed 48 hrs. before top course is added
Los Angeles	150°-300°	80% asphalt	1½ gal. per sq. yd.	1 gal. on 2nd course ½ gal. on top course	Sprinkle and roll till loaded wagon does not disturb.	Stone dry for 1″ deep before any oil applied. Lay undisturbed for 12 hrs. before top course is added.
San Monica	300°	70° asphalt S.G. 10°-12° B.	3 to 3½ gal.	2 gal. in earth 1½ gal. on 2nd course	Sprinkle as oil is mixed with earth. Roll top solid.	.....
Berkerly	+150°	78% asphalt	¾ gal.	¾ gal. on gravel. Let stand 5 days	Sprinkle top course and roll solid.	.....
Santa Barbara	+180°	75% asphalt	1½ gal.	¾ gal. on 1st course ¾ gal. on top course	Sprinkle and roll solid	Lay undisturbed 24 hrs. before top course is added.
Bakersfield	+175°	70% asphalt	2 gal.	1 gal. in earth ⅝ gal. on 2nd course ⅜ gal. on top course	Rolling tamper on 1st course till unyielding Smooth roller on top course till unyielding	
Sacramento	+150°	75% asphalt S.G. 10°-12° B.	2½ gal.	1¾ gal. 2nd course ¾ gal. top course	1st course 3 rollings 2nd course 5 rollings Top course 2 rollings	Stone dry 1½″ deep before oil is applied. Undisturbed 2 days.
New Jersey (state)	150° to 200°	99½% bitumen S.G. 13.5° B.	.....	On 2nd course and top in 2 applications	Unyielding	Stone perfectly dry when oil is applied—not even dew.
Boise	200°-250°	75% asphalt S.G. 10°-11° B.	1¾ gal.	¾ gal. on 1st course ¾ gal. on 2nd course ¼ gal. on top course	Unyielding	.....

ROAD METHODS IN GREAT BRITAIN

Road Board "Directions and Specifications" for Surface Tarring, Tar Macadam and Pitch Grouted Macadam —Specifications for Tars from Gas Works and Tar Distillers, Pitch and Tar Oils

THE ROAD Board of Great Britain has just made public "general directions and specifications" prepared for it by its advisory engineering committee, which probably contains the latest authoritative conclusions derived from several years' experience and experiments in that country. These are divided into six heads, the titles of which are: "General Directions for Surface Tarring," "General Directions for Surfacing with Tar Macadam," "General Directions for Surfacing with Pitch-Grouted Macadam," "Specifications for Tar No. 1," "Specifications for Tar No. 2," "Specifications for Pitch."

These specifications and directions are of such importance that, although in certain respects, chiefly that of climate, conditions are different in Great Britain from those in this country, it seems worth while to reproduce them; omitting certain sections which are of local application, which are duplicated in the several sections, or which are generally recognized in this country as common and desirable practice. In connection with differences of climate it may be mentioned that the differences between England and the north Atlantic sea board of this country is probably less than that between the eastern and the western or between the northern and the southern sections of the United States. The selected portions of the Road Board's Report are as follows:

No. 1.—General Directions for Surface Tarring

1. Surface tarring may be advantageously applied either to an old road surface in good condition or to a new surface after it has been consolidated and dried, but the tarring should never be carried out unless the road is thoroughly dry.

If there are any depressions, pot-holes, waves, grooves, or other irregularities, these should as far as practicable be made good before tarring is commenced, so as to provide an even surface.

2. Painting and spraying machines get through the work of tarring more rapidly than application by hand, and consequently are to be recommended; but hand work gives satisfactory results, and the selection of the method to be employed must be largely determined by the available supply of efficient labor.

3. If it is intended to tar an old surface it is advisable to take advantage of the early months of the year to scrape or brush the road during wet weather as a preparation for subsequent tarring, and especially to keep the road free from caked mud.

6. The road while being tarred should be closed to traffic over half its width, or, where practicable, over its whole width.

7. The road should be thoroughly brushed and cleaned before application of the tar. Wet brushing should be used some time previous to dry brushing, if there is any caked mud. Any method of brushing may be used which will scour and clean the road thoroughly, the best being horse brushing, followed by hand brushing.

9. The tar should be heated to its boiling point at convenient positions on the works, and should be applied as hot as possible, so that it may flow freely. The desired temperature will be generally found in practice to lie between 220 deg. and 240 deg. Fahr. for Tar No. 1 and between 260 deg. and 280 deg. Fahr. for Tar No. 2.

10. In order that the tar should be applied to the road as hot as possible, it is advisable, if the method of application is by hand, to use flexible pipes to convey the tar from the boiler to the point of application. If these are not available, it will be found convenient in case of hand-pouring to use 3-gallon cans specially constructed for the purpose, fitted with spouts leading direct from the bottom of the cans, and being not less than 1½ inches in diameter at the orifice.

11. Immediately on application the liquid tar should be brushed so far as necessary, to ensure regularity in thickness of the coating.

12. The quantity of tar required will vary according to the physical conditions of the road, but generally, in the case of a road to be treated with tar for the first time, the quantity should be one gallon to coat from 5 to 7 square yards.

13. If the road must be opened for traffic before the tar has set hard, grit should be spread on the surface to prevent the tar from adhering to the wheels of vehicles, but gritting should be delayed as long as possible, and the quantity of gritting material to be spread should be no more than sufficient to prevent the tar from adhering to wheels. Stone chippings, crushed gravel, coarse sand, or other approved material (free from dust) not larger than will pass through a ¼-inch square mesh should be used for gritting, in quantity not exceeding one ton for 300 to 350 square yards if grit is used, and one ton for 200 to 250 square yards if coarse sand is used.

Caution—While Tarring in Progress Cyclists Advised to Walk

It is specially desirable to place warning notices at points in the neighborhood of the work where other roads join or cross the road being tarred, to enable motorists and cyclists to avoid the obstructed road by taking any available alternative route.

16. On heavily traveled roads it is advisable to apply a second coat to either the whole width, or from 9 to 12 ft. of the centre of the road, in quantity of one gallon to coat from 8 to 10 yards square about two to three months after the first application.

17. Surface tarring should be renewed annually on all important roads, and as required on roads with light traffic. On such recoatings the quantity of tar to be applied will vary with the extent to which the previous coating of tar has been removed by weather or by traffic.

18. Two or more samples of the tar used should in all cases be kept in quart tin cans, and be carefully labelled, including particulars fixing the locality or length of the road on which the tar was used. The Road Board will arrange with the National Physical Laboratory to submit a selection of these samples to a series of chemical and physical tests with a view to the results being recorded for future reference, and surveyors will from time to time be invited to send samples for the purpose.

19. In all cases careful record should be kept of the condition of the road surfaces in winter and summer, both before and after tarring, the quantity and quality of tar used, the superficial area covered, the state of the weather when the work is being done, the time occupied in actual work and in waiting while work is stopped owing to wet weather, the number of men employed, and full details of the cost of labor and material.

20. Surveyors are invited to send records to the Road Board to be classified and published for general information. Forms for these records will be supplied by the Board.

No. 2.—General Directions for Surfacing with Tar Macadam

1. Any road which is to be surfaced with tar macadam should have a proper foundation or sub-crust of adequate thickness to bear the traffic likely to use it.

2. Before laying a new surface of tar macadam the thickness of the old crust, including foundation, should be ascertained by opening trial trenches at intervals averaging about 150 yards, extending from the haunch of the road to the centre, such trenches to be made alternately on opposite sides of the road.

3. The thickness of the surface coating of tar macadam when consolidated by rolling should be from 2 to 3 inches, according to traffic requirements. For a greater thickness than 3 inches the material should be applied in two coats.

4. In the case of naturally hard sub-soils, not materially softened by infiltration of surface water, the total thickness of the road crust, including foundation, if any, after consolidation of the new surface of tar macadam by rolling, should not under ordinary circumstances be less than 6 inches, unless the sub-soil is so hard as in itself to act as a good foundation, in which case the thickness of the road crust may be reduced to 4 inches. In the case of clay or other yielding sub-soils the total thickness should not be less than 11 inches.

5. The finished surface should have a cross-fall of about 1 in 32.

If the crust is not sufficiently thick at the crown to enable this cross-fall to be obtained with a new coating of the thickness above mentioned, then the old surface should be left intact and unscarified and the thickness of the new coat of tar macadam increased as far as may be necessary.

If the crust is of sufficient thickness for the purpose, the regulation of the cross-fall should be carried out by scarifying the surface and removng material from the crown to the sides previous to the application of the new coating. The material loosened by scarifying should be screened and all finer material than ½ inch should be thrown aside.

6. The aggregate of the new surface of tar macadam should be composed of broken stone of approved quality, or selected slag of approved quality, and should contain at least 60 per cent. broken to the size of 2½ inches, not more than 30 per cent. of from 2½ to 1¼ inches, and 10 per cent. of ¾ to ½ inches for closing. The last mentioned size should be kept separate and used as top dressing during rolling operatons.

7. The stone used must be thoroughly dried before being coated with tar.

8. For making tar macadam, tar should be used which complies with Road Board Specification Tar No. 1, or Road Board Specification Tar No. 2, the choice being determined by the circumstances of each case.

If Tar No. 1 has been used for tarring the stone, care should be taken, especially in hot weather, that the tarred material has been allowed to stand for a sufficient length of time to allow the tarred surface of the stones to become partially hardened and in a tacky condition.

If Tar No. 2 has been used for tarring the stone, the macadam should be laid soon after being tarred, and if the tar be of the heavier grade of this quality, the stone coated with such tar should only be laid when the road is quite dry and in warm, sunny weather.

9. The quantity of tar used to coat one ton of stone should be approximately from 9 to 12 gallons, varying according to the sizes of the stone, the grade of tar used, the method of mixing and other conditions.

10. The tar-macadam, after having been spread and levelled, should be rolled into a smooth surface, but too much rolling should be avoided.

Less rolling is required than in the case of water-bound macadam.

A ten-ton roller is a suitable size for use in most cases, but good results can be obtained by using a six-ton roller and finishing with a ten-ton roller.

11. In order to get the best results from the use of tar macadam, it is advisable to apply a coating of tar to the surface after the road has been used by traffic for several weeks. This tar should comply with the provisions of Road Board Specification for Tar No. 2, and should be poured or sprayed on the surface at a temperature of about 270 deg. Fahr.

12. Stone chippings, crushed gravel, coarse sand, or other approved material (free from dust), not larger than will pass through a ¼-inch square mesh, should be used for gritting in quantity not exceeding one ton for 350 to 400 square yards if grit is used and one ton for 200 to 250 square yards if coarse sand is used.

Note.—*These general directions are not intended to displace or to discourage the use of proprietary articles, of which there are several of proved value.*

No. 3.—General Directions for Surfacing with Pitch-Grouted Macadam

3. The thickness of the surface coating of pitch-grouted macadam when finished and consolidated by rolling should be 2½ to 3 inches (except on very light-traffic roads, when the thickness may be 2 inches) for single-pitch grouting, and from 4 to 4½ inches for the double-pitch grouting hereafter described.

8. It is important that the pitch should not be poured if the surface of the stone is wet. The stone may be protected by tarpaulins, or, if wet, may be dried *in situ* by portable blowers, or other means.

9. The quantity of pitch required to grout a single coating is approximately, for a consolidated thickness of 2 inches, 1¼ gallons per yard square; for 2½ inches, 1½ gallons per yard square, and for 3 inches, 2 gallons per yard square; but these quantities may vary with different materials, and care must always be taken to fill the voids adequately.

10. The aggregate after having been spread must be rolled down dry until the surface is formed, but without the addition of any small material.

11. The pitch, after being carefully melted, as described in Clause 18, must be raised to a temperature of 300 deg. Fahr. Clean, sharp sand must be heated on sand heaters to a temperature of 400 deg. Fahr. A dandy, or portable mixing vessel, is then to be filled with equal parts, by measurement, of the heated pitch and the hot sand, and the mixture, hereafter called the matrix, is to be kept well stirred while it is being emptied from the dandy or portable mixing vessel into pouring cans of from 2 to 3 gallons capacity, which are used for pouring matrix onto the roadway. Not only during the process of mixing, but afterwards, right up to the time of actual pouring, the matrix must be kept well stirred. The matrix prepared with pitch in the quantities specified in Clause 9 should be sufficient to fill the voids of the aggregate.

12. The final rolling should be commenced immediately after pouring the pitch matrix, and carried on rapidly before the matrix has time to set. The 5 per cent. of graded chippings should be spread over the grouted surface in part previously to and the remainder during the process of rolling. The traffic may be allowed onto the finished surfaced as soon as the surface has cooled to the normal temperature.

Double Pitch-Grouting

13. When the traffic is so heavy that a consolidated thickness of from 4 to 4½ inches of pitch-grouted macadam is required, it is desirable, in order to obtain the best and most economical results, to divide the coating into two layers, the bottom layer to be the thicker one and to consist of large stones, the two layers being rolled down and grouted separately. Any local stone which can be procured cheaply may, if suitable in quality for foundation work, be used for the bottom layer graded from 3-inch gauge down to 2-inch gauge. No chippings are required for finishing the rolling of the bottom layer. The aggregate for the upper layer should consist of hard road stone of approved wearing quality, broken to 1½-inch gauge, and 5 per cent. of chippings of the same stone used for the upper layer, graded from ½ inch down to ¼ inch, should be added before and during the process of rolling, and rolled down so as to form the finished surface of the road.

14. In pouring the pitch on the bottom layer the surface of the pitch should not be brought to the surface of the stone, but should lie about ½ inch below such surface, with the object of providing a key for the upper layer.

16. The quantity of pitch required for double pitch-grouting is approximately, for a considerable thickness of 4 inches, 3¼ gallons per yard square, and for 4½, 3½ gallons per yard square; but these quantities may vary with different materials, and care must always be taken to fill the voids in the surface coating adequately.

17. For the purpose of accurately ascertaining the proportions necessary for the matrix, it is essential that portable weights, scales and measures be provided, and all materials used in the preparation of the matrix should be accurately proportioned by weight or measurement.

Instructions for Melting the Pitch

18. The pitch boilers of from 2 to 3 tons capacity should be charged with pitch and about one-half of the proper porportion of tar oils. The fire should then be lighted, and thereafter a steady fire, with fire doors closed, should be maintained, when, in from four or five hours, the pitch should be thoroughly melted. A bright fire should be kept until the pitch reaches a temperature of 300 deg. Fahr., when the remainder of the oils should be added, and the mixture thoroughly stirred; the fire doors should then be opened and the temperature of the melted pitch permitted to fall to 250 deg., or 270 deg. Fahr. The pitch should then be ready for use, and in all cases should be thoroughly well stirred before being drawn off.

In the event or bad weather stopping the work of grouting, the fire door should be left open, the damper closed and the temperature of the pitch allowed to fall to 200 deg. Fahr. It can be kept at this temperature for long periods with banked fires consuming 7 lbs. of coke per hour.

It is recommended that a suitable Fahrenheit thermometer with metal protection should be at hand to indicate the temperature of the melted pitch. Whenever the weather is favorable for the recommencement of the work the pitch must be again raised to 270 deg. Fahr. by closing the doors and sharp firing.

It is desirable that the boiler should be kept air-tight when the pitch is being melted, by the use of air-tight covers properly packed, so as to make an air-tight joint.

Note.—*These general directions are not intended to displace or to discourage the use of proprietary articles, of which there are several of proved value.*

No. 4.—Specifications for Tar No. 1

1. *General*—This tar is suitable for the surface tarring of roads.

As to the use of this tar for making tar macadam, see "Road Board's General Directions for Surfacing with Tar macadam."

2. *Boiling.* The tar should be applied as soon as the boiling point is reached, and over-boiling should be avoided. The desired temperature will be generally found in practice to lie between 220 deg. and 240 deg. Fahr. in the boiler.

3. *Source of Tar.* The tar shall be derived wholly from the carbonization of bituminous coal, except that it may contain not more than 10 per cent. of its volume of the tar (or distillates or pitch therefrom) produced in the manufacture of carburetted water gas.

4. *Specific Gravity.* The specific gravity of the tar at 15 deg. C. (59 deg. Fahr.) shall be as nearly as possible 1.19, but in view of the great variation in specific gravity of the tars produced in various parts of the country, the specific gravity may be as low as 1.16, or as high as 1.22, provided that in other respects it complies with the provisions of the specification.

5. *Freedom from Water.* The tar shall be commercially free from water—*i. e.,* it shall not contain more than one per

cent. by volume of water or ammoniacal liquor, which water or liquor (if present) shall not contain more ammonia, free or combined, than corresponds to 5 grains of ammonia per gallon (=70 milligrammes per litre) of the tar.

6. *Phenols.* On vigorous agitation for a quarter of an hour with twenty times its volume of water at 21 deg. C. (70 deg. Fahr.), the tar shall not impart to the water more than 5 grains of phenoloid bodies, reckoned as phenol, per gallon of water (=70 milligrammes per litre).

Tar from Gasworks

The provisions in the following Clause 7, 8 and 9 apply to tar supplied direct from gasworks.

7. *Source of Tar.* The tar shall be solely the natural by-product of the manufacture of illuminating gas (coal-gas with or without admixture of carburetted water gas), and shall have been subjected to no other or further treatment than may be necessary for the abstraction of water or ammoniacal liquor and light oils.

8. *Fractionation.* On distillation the tar must yield, below 170 deg. C., not more than one per cent, and between 170 deg. C. and 270 deg. C., not less than 16 per cent and not more than 26 per cent of distillate (exclusive of water).

9. *Free Carbon.* The free carbon shall not exceed 16 per cent of the weight of the tar.

Tar from Tar Distilleries

The provisions in the following Clauses 10 and 11 apply to tar supplied from tar distilleries.

10. *Fractionation.* On distillation the tar must yield, below 170 deg. C., not more than one per cent, and between 170 deg. C. and 270 deg. C. not more than 26 per cent of distillate (exclusive of water). The distillate shall remain clear and free from solid matter (crystals of naphthalene, etc.) when maintained at a temperature of 30 deg. C. for half an hour. The distillation shall be continued to 300 deg. C. and the residual pitch thus obtained shall not amount to more than 73 per cent of the weight of the tar.

11. *Free Carbon.* The free carbon shall not exceed 16 per cent of the weight of the tar.

12. *Taking of Temperatures.* The temperature during distillation shall be taken by a thermometer of which the bulb shall be opposite the opening to the side tube of the distillation flask, and the quantities of distillates and free carbon shall be stated in percentages by weight of the portion of tar submitted to distillation.

13. *Dehydrated Tar.* A tar prepared by simple dehydration fulfilling the provisions of this specification may be used with satisfactory results in most cases, but tars from which the naphthalene has been extracted are superior for the purposes of surface tarring.

Note.—This specification is not intended to displace or to discourage the use of proprietary articles, of which there are several of proved value.

SPECIFICATION FOR TAR NO. 2

1. *General.* This tar is suitable for surface tarring, and is specially recommended for re-tarring; but if the heavier grades of the tar are used, care should be taken to apply it only when the road is dry and well warmed by the sun's rays, otherwise it will not flow freely.

As to the use of this tar for making tar macadam, see "Road Board General Directors for Surfacing with Tar Macadam."

2. *Boiling.* The tar is to be applied as soon as the boiling point is reached, and over-boiling should be avoided. The desired temperature will be generally found in practice to lie between 260 deg. and 280 deg. Fahr. in the boiler.

3. *Source of Tar.* The tar shall be derived wholly from the carbonization of bituminous coal, except that it may contain not more than 10 per cent of its volume of the tar (or distillates or pitch therefrom) produced in the manufacture of carburetted water gas.

If pitch be added to the tar in order to secure the specific gravity and proportion of residual pitch referred to below, the pitch so added must also have been derived from tar of the foregoing description.

If oil be added to heavy tar or pitch in order to secure the specific gravity and proportion of residue referred to below, the oil so added must be derived from tar of the foregoing description and must be practically free from naphthalene and tar acids or phenols.

4. *Specific Gravity.* The specific gravity of the tar at 15 deg. C. shall be as nearly as possible 1.21, and in no case shall it be lower than 1.18 or higher than 1.24.

5. *Phenols.* (Same as 6 of Specification for Tar No. 1.)

6. *Fractionation.* The tar shall be free from water and on distillation shall yield no distillate below 140 deg. C., nor more than 3 per cent of distillate up to 220 deg. C., which distillate shall remain clear and free from sold matter (crystals of naphthalene, etc.), when maintained at a temperature of 30 deg. C. for half an hour.

Between 140 deg. and 300 deg. C. it shall yield not less than 15 per cent, nor more than 21 per cent of the weight of the tar.

7. *Free Carbon.* The free carbon shall not exceed 18 per cent of the weight of the tar.

8. *Taking of Temperatures.* (Same as 12 of Specifications for Tar No. 1.)

Note.—This specification is not intended to displace or to discourage the use of proprietary articles, of which there are several of proved value.

SPECIFICATION FOR PITCH

1. *General.* This pitch is suitable for pitch-grouting. See "Road Board's General Directions for Pitch-grouting."

2. *Preparation.* The pitch is obtained by softening the material known as commercial soft pitch, as specified below, by the addition of tar oils, also specified below.

COMMERCIAL SOFT PITCH

3. *Source of Pitch.* The pitch shall be derived wholly from tar produced in the carbonization of bituminous coal, except that it may contain not more than 10 per cent of pitch derived from tar produced in the manufacture of carburetted water gas.

4. *Fractionation.* On distillation the pitch shall yield, below 270 deg. C., not more than one per cent of distillate; between 270 deg. C. and 315 deg. C., not less than 2 per cent and not more than 5 per cent of distillate.

5. *Free Carbon.* The free carbon should not exceed 22 per cent of the weight of the pitch, but if it be found difficult or unduly expensive to obtain this quality of pitch, a quality containing as much as 28 per cent of free carbon may be used with a reduced proportion of sand as filler.

6. *Taking of Temperatures.* (Same as 12 of Specifications for Tar No. 1.)

TAR OILS

7. *General.* The tar oils to be used shall be derived wholly from tar produced in the carbonization of bituminous coal, or from such tar mixed with not more than 10 per cent of its volume of tar produced in the manufacture of carburetted water gas.

8. *Specific Gravity.* The specific gravity of the tar oil at 20 deg. C. shall lie between 1.065 and 1.075.

9. *Freedom from Naphthalene.* The tar oils after standing for half an hour at 20 deg. C. shall remain clear and free from solid matter (crystals of naphthalene, etc.).

10. *Fractionation.* The tar oils shall be commercially free from light oils and water—*i. e.*, on distillation shall yield not more than one per cent of distillate below 140 deg. C.

The amount of distillate between 140 deg. C. and 270 deg. C. shall lie between 30 per cent and 50 per cent.

11. *Taking of Temperatures.* (Same as 12 of Specfications for Tar No. 1.)

12. *Proportions.* The proportions by weight in which the pitch and tar oils are to be mixed shall be as follows:

Pitch 88 per cent to 90 per cent.

Tar oils 10 per cent to 12 per cent.

Note.—This specification is not intended to displace or to discourage the use of proprietary articles, of which there are several of proved value.

ROAD IMPROVEMENT IN NOVA SCOTIA

NOVA SCOTIA possesses, according to official figures, some 18,000 miles of highways, divided into road districts much as in the United States, and under the superintendence of the road commissioner of the Province. Of this total it is estimated that 10,000 miles are fairly good road for driving and automobiling, and every year many miles of graveled road are being added. During the year ended September 30, 1910, work to the amount of $163,512 was done, and other work undertaken or mapped out, calling for an additional expenditure of $21,951. This aggregated an outlay of approximately $10,000 per county, which is about the usual average in this Province.

The revenue for road repair in Nova Scotia is derived from taxes upon property (a certain per cent of the whole going to the road fund) and from a poll tax, these being paid either in cash or labor at the prevailing wage rate per diem. The property tax for the fiscal year 1910 amounted to about $95,000 in the 18 counties of the Province, and the poll tax to more than $80,000, making a total of $175,000, and this was pro rated among the several counties according to their requirements. Of this sum 70 per cent was paid in labor—"worked out," as it is called.

During the year 25 road machines were imported from the United States at a cost of $5,375; one grader, also from the United States, and some other machinery were likewise pur-

chased, a total of nearly $10,000 having been expended for new machinery. There are now about 75 road machines and 20 graders in the Province. During the last five or six years road machinery to the value of over $20,000 has been purchased, much of it from the United States.

It is estimated that there are 72,000 culverts in Nova Scotia, ranging from 6 feet in width down to one foot. Practically all of the culverts constructed up to a short time ago were of wood, costing on an average $7 each, but some concrete, hard or vitrified brick, and stone culverts have been built in the last few years. Concrete culverts can be put in for an average cost of $20 or $25. They last several times longer than a wooden structure and require less attention and repair.

ROAD BRIDGES IN COLORADO

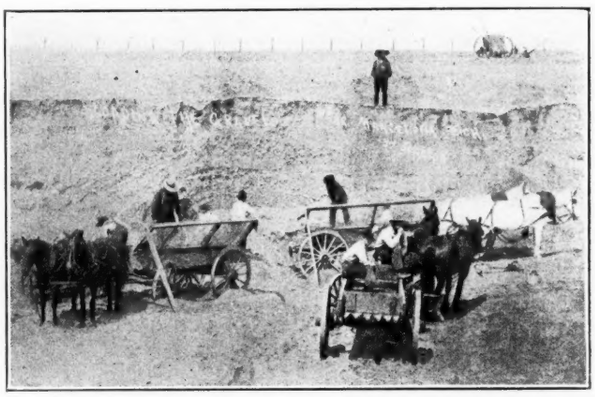
A PECULIAR style of bridge called a "flush" bridge has been built by the Colorado State Highway Commission, which is certainly unusual in that it is laid on the bed of the creek rather than spanning it. This creek is one of those which are more or less numerous in that section of the country, which seldom contain any water (visible upon the surface at least), but are subject to heavy floods. The creek is of a sand which it was impossible to haul a heavy load through, but an ordinary road constructed on it would have been washed away by the first flood. Under these conditions this so called flush bridge was built, being anchored to piles driven into the bed of the creek. These piles were built in sets of three across the roadway, which was 13 feet wide, the sets or bents being spaced 12 feet between centers. The heads of the piles were cut off a little below water level in the bed of the creek and capped with reinforced concrete sills whose top surfaces were brought up about flush with the surface of the sand. These sills support reinforced concrete slabs which are anchored to them by the reinforcement. There are two of these bridges or roadways, each of them about 400 feet long. The entire structure has sufficient strength to carry a 15-ton road roller or traction engine without receiving any support from the sand under the slabs.

At another creek crossing a reinforced concrete slab floor is supported upon reinforced concrete piles; the use of wooden piles being considered objectionable in that "wooden piling would not endure above water level." The longest of the piles are 54 feet in length.

HOME-MADE ROAD APPLIANCES

THE third biennial report of the State Highway Commissioner of Michigan for the years 1909 and 1910 contains descriptions of simple devices which can be cheaply manufactured by road commissioners or others for use in making gravel roads; together with instructions for constructing such roads. One of these is a contrivance for screening gravel at the bank. This consists of a screen so attached to the side of the cart which is to haul the gravel that the gravel is screened and deposited in the cart without any rehandling. This wagon screen is described as follows:

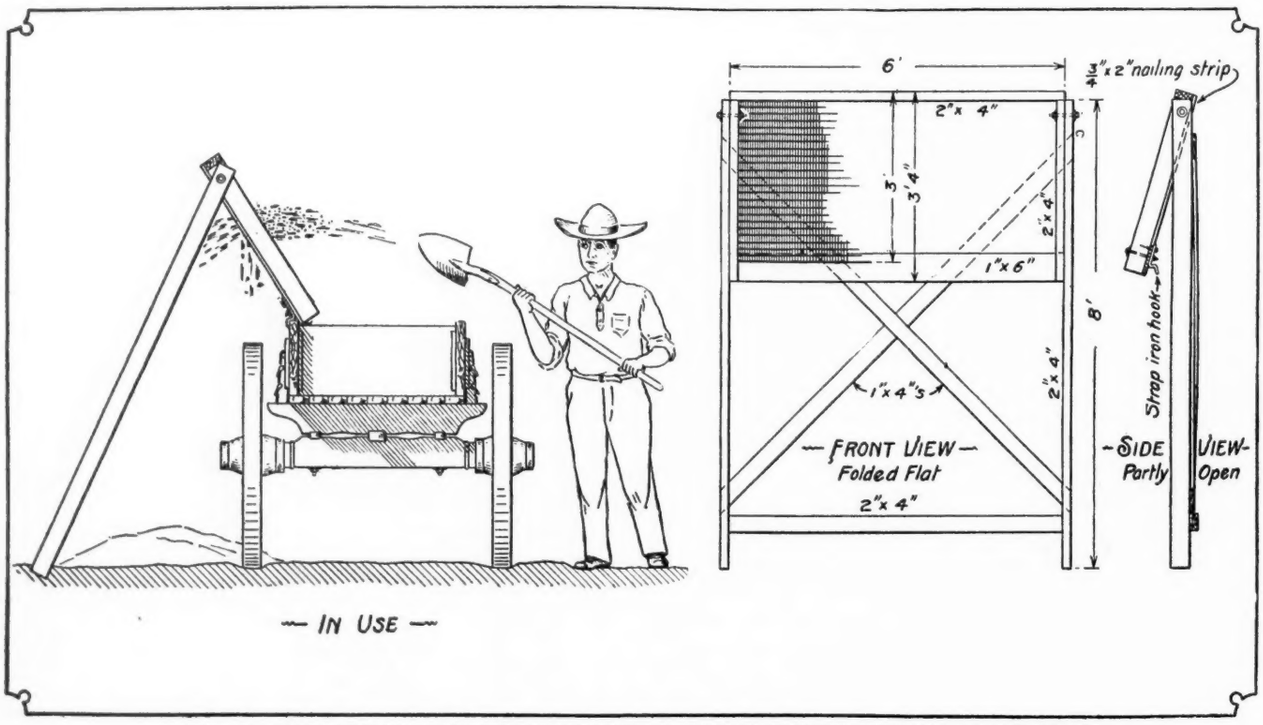
This is a long screen about the length of the wagon box and three feet wide, which is attached to the far side of the box. The gravel is shoveled over the box against the screen, allowing the pebbles to slide back into the wagon while the sand falls through the screen onto the ground on the opposite side.



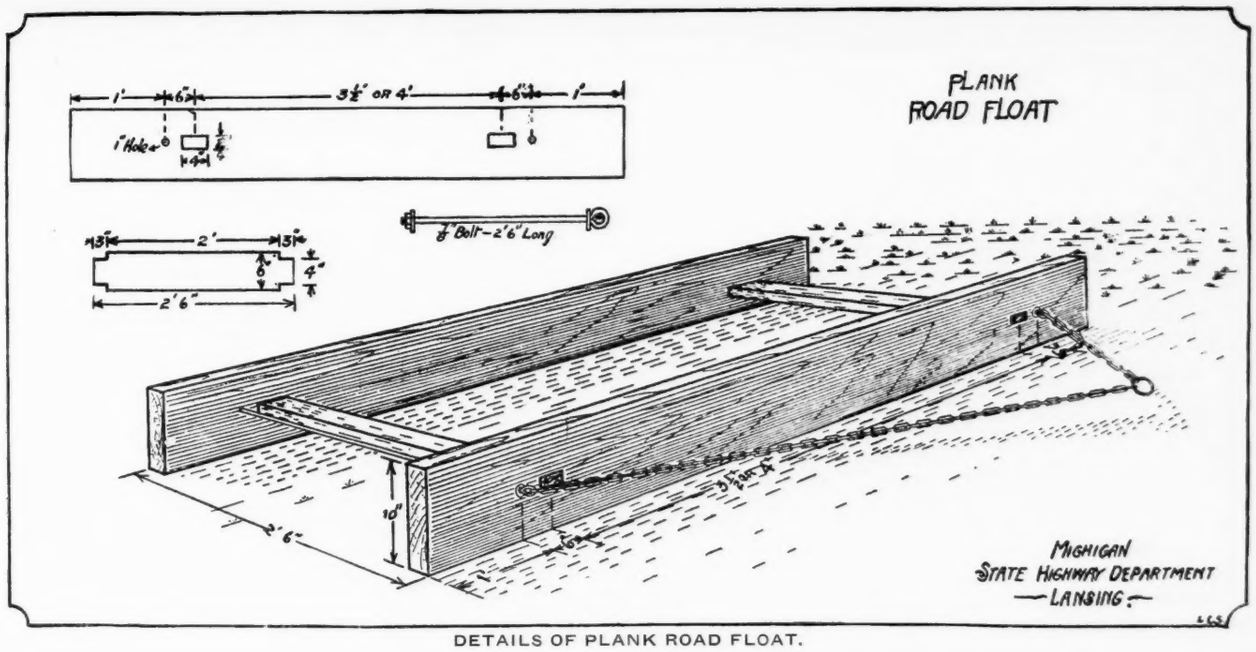
WAGON SCREENING DEVICE IN USE

Hand screening is more expensive [than portable power screening plants], frequently costing as much as 40 cents per cubic yard for the screened product. Wherever the screening of sandy gravel has been tried the quality of the roads has been so much improved that the people are satisfied that the extra cost is a good investment.

For rolling either gravel or dirt roads the commissioner suggests a method of constructing a five-ton roller at a cost of about $50. "Purchase a boiler shell 4 ft. 6 in. long and 3 ft. 9 in. in diameter. Set it upon end, put a shaft in the center

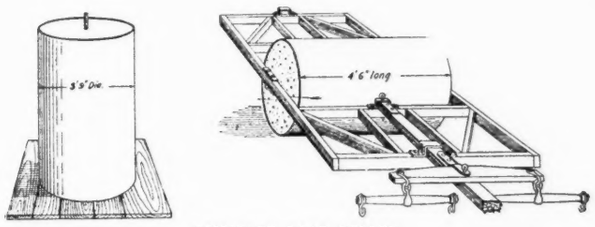


WAGON SIDE GRAVEL SCREENING DEVICE, MICHIGAN STATE HIGHWAY DEPARTMENT.



DETAILS OF PLANK ROAD FLOAT.

and fill the shell with concrete. Make a frame like the one illustrated and you will have a five-ton road roller at a cost of about $50."



CONCRETE ROAD ROLLER

The log drag has been generally described by papers of all classes, so that it is thoroughly familiar. The "plank float" is not so well known and is described in this report as follows:

The plank float can be made from an ordinary bridge plank by sawing it in two in the middle. The two planks forming the sides should be at least 2 inches thick, preferably 2½ or 3 inches, from 10 to 12 inches wide and 6½ or 7 feet long, and of hard wood. A platform of inch boards, loosely nailed to the cross pieces allows the driver to ride whenever the float does not move enough earth. He also varies the weight on different parts of the float, as may be required, by shifting his position.

The float is made more lasting by bolting a steel plate ¼-inch thick and 3 inches wide on the front of each plank. However, if this is not done, the float can be used, both sides forward and both sides up, thus wearing off all four edges of each plank before it has to be thrown away.

The ring or eye in the long bolt should be large enough to readily permit a log chain to slip through. A ¾-inch or ⅝-inch bolt will usually be large enough. The cost of these floats, lumber and labor, all told, should not exceed $2.50 or $3 each.

SPECIFICATIONS FOR MACADAM ROADS

Bituminous Macadam and Bituminous Concrete Paving—Complete Standard Specifications of the Association for Standardizing Paving Specifications—Asphalt and Coal Tar Cements—Mixing and Laying

The specifications given below are those adopted by the Association for Standardizing Paving Specifications at their meeting in January of this year. These cover macadam with a bituminous binder and bituminous concrete, which latter the committee defined as "Any mixture suitable for paving purposes composed of broken stone, sand and bituminous cement, mixed together before being laid, and which is laid while in a plastic condition. If the stone is spread in place and the bituminous cement or binder applied afterward, the resulting product is bituminous macadam." Strictly speaking the so-called specifications for the bituminous concrete pavement are not specifications but rather a description of the method recommended for constructing such a pavement. These recommendations, however, can be used as the basis for formal specifications. On a number of points the committee presents alternative methods depending upon conditions of traffic, materials available, etc.

Concerning the use of bituminous concrete the committee stated in their report: "It is the belief of your committee that bituminous concrete may be successfully used as a paving material under a great variety of conditions and traffic; that it is especially adapted to use on a well constructed macadam base, either new or old, plain or bituminous, and finds an especial field in providing a permanent wearing surface on old macadam."

The committee decided to recommend only methods, proportions and materials which had been tried successfully and considered only the bituminous cements which retained their original consistency for mixing and laying, excluding from consideration emulsions, oils volatile in character and cements softened with light fluxes so that they can be worked cold or at low temperatures. The cements specified are practically solid at ordinary atmospheric temperatures and required to be hot while being mixed with the stone and sand.

Concerning the range of penetration for asphaltic cements the committee stated: "A penetration of 40 will give a hard and stable pavement, while 100 will give a pavement too soft for heavily traveled streets. The choice should be made to meet conditions and the specifications applying to any particular case

drawn closer within the limits named for penetration, working temperatures, etc."

The committee which prepared the specifications for macadam pavement consisted of J. L. Darnell, chairman, consulting engineer, Kansas City, Mo.; E. H. Thomes, vice-chairman, assistant engineer Bureau of Highways, Borough of Queens, New York City; W. G. Leininger, assistant superintendent of street, Department of Public Works, Chicago, Ill.; A. C. Schrader, superintendent and engineer, West Park Commissioners, Chicago, Ill.; C. L. Hutchinson, member Board of Public Works, Indianapolis, Ind.; W. T. Brooke, city engineer, Norfolk, Va.

That which prepared the specifications for bituminous concrete pavement was as follows:

Linn White, chairman, engineer South Park Commissioners, Chicago; J. M. Burrows, assistant civil engineer in charge of street construction, Des Moines; Henry M. Milburn, city asphalt chemist, Omaha; G. F. McGonagle, city engineer, Salt Lake City; L. W. Rundlett, commissioner of public works, St. Paul; W. J. Hardee, city engineer, New Orleans; J. C. Ely, director of public service, Dayton; W. H. Connell, assistant commissioner of public works, Borough of Bronx; James A. Hooke, assistant sewer commissioner, St. Louis; M. R. Sherrerd, chief engineer Department of Public Works, Newark.

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MACADAM PAVEMENT

Roadbed Sub-Grade

The full width of the roadbed shall be brought to the proper line, grades and cross section indicated on the plans by excavating, filling and thoroughly rolling with an approved road roller weighing at least ten tons; all soft or spongy ground shall be removed and refilled with gravel or other approved material which will pack, and the rolling shall be continued until the roadbed is thoroughly consolidated and shaped to the satisfaction of the engineer. A wooden templet, shaped to the proper size and crown of —inch per foot from center to side, or other equally satisfactory methods shall be used to obtain the required contours of all the courses.

Note.—The crown may be from ⅜ to ¾ inch per foot, to be determined by the engineer for each particular case.

Drainage

(Insert specifications for transverse and longitudinal pipe or stone drains and Telford or large size stone macadam foundation to meet local conditions.)

Upon the properly prepared foundation shall be placed the specified crushed stone macadam laid in two courses.

Stone

(Insert specifications for character and quality of stone to best meet local requirements.)

The product of the stone crusher shall be separated into three grades or sizes by any satisfactory method or by means of a stone screen having circular openings of the following diameters: ⅜ of an inch, one (1) inch, and three (3) inches. These grades shall be hereinafter designated as screenings, ⅝-inch stone and 2-inch stone respectively.

The above specification is designed to utilize all the product of the rock crusher; the 2-inch stone to be used for both the top and bottom courses, the screenings to fill the voids in the lower course and the ⅝-inch stone to fill the interstices in the top course and form part of the wearing surface.

This clause is open to suggestions, criticisms and further modifications. At the present time, stone is specified by a minimum and maximum length, by a maximum diameter in passing through the circular openings of a revolving stone screen, by an average of the diameters of the openings of the screens and by arbitrary designation of sizes or numbers; also by variable combinations and percentages of the above, and by proportions between the maximum, minimum and average length. It is recommended that this Committee confer with the committees of this Convention on Concrete and Bituminous Concrete and later take up the matter with committees of similar organizations and with quarrymen and manufacturers of stone crushing and screening machinery, with a view of standardizing the grades and sizes of crushed stone. By such standardization along practicable commercial lines, stone plants can be operated more advantageously, the stock sizes can be prepared and stored in slack times, orders can be filled quicker, competition will be encouraged and the price of stone will be reduced, together with other advantages.

Lower Course

The lower course shall consist of run of crushed stone, which shall pass a three (3) inch and be retained on a one (1) inch screen. The stone shall be laid upon the properly prepared foundation to a depth of four (4) inches when compacted. The depth of the loose stone in all cases shall be fixed by laying upon the sub-grade cubical blocks of wood of the proper size and spreading the stone evenly to conform thereto. This course shall be thoroughly rolled until the stone does not creep or wave ahead of the roller. Stone screenings or sand shall then be uniformly spread over the surface in small quantities by shovels from carts or piles of filler alongside the road and the rolling continued, sweeping in the screenings meanwhile until no more will go in dry, when the surface shall be well sprinkled by an approved sprinkler to fill the voids, screenings being added where necessary and the rolling continued until the surface is satisfactory finished. No filler shall be left on the surface, but the surface shall be left with the clean stone projecting for a bond, leaving the lower voids thoroughly filled.

Note.—*Upon a poor foundation or where a finished depth of stone of more than 4 inches is deemed advisable, the stone shall be laid in two layers and treated as above described. Good results may be obtained without filling the voids in the lower course, but upon a sandy soil or a well-drained roadbed better results seem to be obtained by thoroughly filling the voids in the stone. Stone screenings, sand, or other suitable material may be used as a filler. Good results may be obtained by a sand filler, and results are also obtained when a small quantity of stone screening dust is used on top of the sand to fill the voids in the sand. The voids may be filled without application of water if all the materials are dry; but a firmer foundation seems to be secured when the course is well puddled with water. In some cases properly screened gravel may be used as a bottom course and as a filler in the top and bottom courses.*

Top or Wearing Surface Course

Upon the bottom course shall be evenly spread crusher-run stone which shall pass a three (3) inch ring and be retained upon a one-inch screen, to a finished depth of two and one-half (2½) inches. This course shall be dry rolled with the steam roller hereinbefore mentioned only until the individual fragments have keyed together; the surface, while even and conforming to the required crown, being left open or porous in order to allow the penetration of the hot bituminous binder.

Bituminous Binder

The bituminous binder shall comply with the following requirements:

Note.—*Insert specifications for binder best suited to meet the local conditions.*

The binder shall be heated in an approved heater equipped with a fixed or portable thermometer which will clearly and accurately indicate the temperature of the binder. The bituminous binder shall be heated to a temperature of not less than 250 degrees Fahr., nor more than 350 degrees Fahr., and shall be uniformly distributed over the macadam by suitable appliances at a rate of not less than one and seven-tenths (1.7) gallons to the square yard. Directly after application, clean trap rock or equally satisfactory stone chips, free from dust and consisting of fragments which will pass a one-inch ring, but be retained upon a three-eighth (⅜) inch screen shall be spread over the surface in sufficient quantities to fill the surface voids and prevent the binder from sticking to the wheels of the roller. Care shall be exercised not to apply more stone chips than will just fill the interstices, and any surplus material shall be swept from the surface as directed. The road shall then be rolled until solid, more stone chips or screenings being applied as required in order to maintain satisfactory conditions.

A seal, flush, paint or squeegee coat of the hot binder shall be uniformly distributed over the surface at a rate of at least one-half (½) gallon to the square yard. Clean stone chips or screenings such as previously described shall then be spread over this seal coat in just sufficient quantity to take up all excess of binder and form a smooth, well-bonded surface when rolled. The road shall be rolled until smooth and firm and to the proper lines and grades.

The stone must be dry and free from dirt or dust at the time of applying the bituminous binder. The applicaton of binder shall not be made when the atmospheric temperature is below 50 degrees Fahr., unless specially permitted by the Engineer.

BITUMINOUS CONCRETE PAVEMENT

New Macadam Foundation

If the pavement is to be laid on a new macadam foundation it shall be built according to the standard specifications for macadam, as follows:

Construct the first course of macadam about 1½ inches less

in thickness than the intended thickness of the completed foundation, thoroughly rolling and bonding the stone by the use of screenings or screenings and coarse sand and water. When this is done spread the second course, consisting of an even layer of about 1½-inch stone without screenings or other fine bonding material, and roll until the particles of stone lie firm and even. If the second course is applied before the first is completely dried out, the layer of 1½-inch stone will be partially imbedded, some of the fine material working up from below and holding it in place. Care should be taken, however, to see that the first course is not soft enough, either from lack of sufficient rolling or excess of water, to completely imbed or fill the second course of stone.

When the bituminous concrete wearing surface is applied to a base thus prepared, it will, under the roller, enter the interstices of the upper layer of stone, completely filling them and bonding the foundation and wearing surface together. This condition is necessary to secure the best results in a bituminous concrete pavement, the base and wearing surface acting together as one homogeneous structure, and not as a pavement made up of foundation and wearing surface acting as two separate layers.

The thickness of the macadam base should vary somewhat, according to the traffic and character of subgrade.

On a well-drained and firm subgrade eight inches of macadam is sufficient for a foundation under any but the very heaviest of city traffic. For streets or roads of medium traffic and good subgrade conditions four to six inches is sufficient.

As an alternate form of construction, when desired, the second course of 1½-inch macadam stone may be poured with a bituminous filler, using not quite enough to fill the voids. Over this there should be spread a light layer of ¾-inch stone, using enough to about half cover the surface, and then giving it a light rolling. This is necessary to put the foundation in a condition to be worked over, as the base thus treated should be disturbed as little as possible.

The bituminous filler used for pouring the base should be of the same character as the bituminous cement in the wearing surface, but in consistenecy it may be somewhat softer and lighter for the purpose of securing better penetration. Thus when asphaltic cement is used in the surface the base should be poured with a filler or binder of asphaltic origin, and when tar cement is used in the surface a tar should be used for pouring the base. If, however, the asphaltic cement has an original penetration as low as 60 the binder for the base should have 60 or higher. With asphaltic cements higher than 60 penetration the same material may be used as binder for the poured base.

On a foundation thus prepared a somewhat thinner layer of bituminous concrete may be used with safety, though the economy of this construction is somewhat doubtful unless the expected traffic is light, in which case the wearing surface of bituminous concrete may be made quite thin, composed of a fine aggregate, as hereinafter specified, and the pavement be considered finished without a seal coat.

Old Macadam Foundation

If th pavement is to be laid on an old macadam, base the surface shall be thoroughly swept and cleaned of all fine material that may be caked upon the surface of the stone or lying loose as dust, thereby exposing the clean, coarse stone for the reception of the bituminous concrete.

If the old macadam does not present the desired coarse, grainy surface, or is not at proper and satisfactory grade after cleaning, it shall be spiked up and redressed to the desired crown and grade, the coarse stone being brought to the top by harrowing or otherwise, or new stone added when in the opinion of the engineer in charge it is needed to give the necessary grainy surface or thickness of foundation. It shall then be thoroughly rolled with the use of as little water as possible, so the surface of the macadam does not flush up smooth.

It is not practicable to pour an old macadam base with a bituminous filler unless a complete new surface of stone is provided, in which case it may be treated as specified for new macadam.

Concrete Foundation.

If a hydraulic concrete foundation is desired it should be laid according to the standard specifications for concrete foundation.

Curb

If a curb or curb and gutter is used, the face against which the paving material will be laid shall be painted with a coat of the hot bituminous cement in advance of the pavement.

A curb or curb and gutter should be used in all cases of a street devoted to miscellaneous uses and where there is occasion for many vehicles to stop at the curb line, but in the case of a park driveway or a suburban highway a bituminous concrete pavement may be successfully used without a curb. No other protection for the edge of the pavement is required except to provide a coarse, grainy base into which the paving material is rolled.

Wearing Surface

On the foundation, as heretofore specified, shall be laid the bituminous concrete wearing surface, which shall consist of a mineral aggregate mixed with bituminous cement and laid as hereinafter specified.

This wearing surface shall have a thickness of inches after thorough compression with a roller.

For heavy traffic a thickness of two inches is sufficient for all practical purposes, and in some cases will afford greater stability than a greater thickness.

For moderate and light traffic one and one-half inches, or for light traffic one inch will be sufficient thickness for the wearing surface when laid on a well-constructed macadam base, as specified above.

Mineral Aggregate.

The mineral aggregate shall consist of a mixture of broken stone and sand, to which in some cases may be added a small quantity of stone dust or Portland cement.

Any sound, durable stone, either trap rock, limestone or granite, usually considered suitable for macadam, may be used. It should be broken as nearly cubical as practicable. It should not show distinct planes of cleavage or crystaline faces, and should not readily crush or split under the roller when being rolled in the pavement. Between two kinds of stone, choice should generally be made of the one showing the greates toughness, rather than hardness. A certain percentage of absorption, such as is shown by the better grades of limestones, is a desirable quality, as the bonding strength of the cement is somewhat improved thereby.

The stone shall vary in size from a maximum of about half the thickness of the wearing surface to the smallest particle retained on the finest mesh screen commonly used on crushing plants. That is, the minimum screen should be one-fourth inch for dry stone and one-half inch for wet stone. For a two-inch wearing surface the stone would vary in size from that passing a one and one-fourth-inch screen to as small as that held on a one-fourth-inch screen, and for one-inch wearing surface from that passing a three-fourth-inch screen down to the same minimum.

The dust or fine screenings should be removed from the stone, as it usually is excessive and irregular in quantity and necessitates the use of a greater amount of cement.

The sand shall be similar in character to that commonly used in sheet asphalt mixtures. It shall be hard-grained, moderately sharp, free from loam or other foreign material and varying in size from that passing a ¼-inch screen to dust passing a 200-mesh screen. There shall not be over 5 per cent passing the 200-mesh screen and there should not be over 30 per cent held on the 10-mesh screen.

The dust which may be added to the mixture shall be either a Portland cement or ground limestone. Its purpose is to act as a filler and stiffen or harden up the paving mixture to meet conditions of heavy traffic or to add stability to a tar cement or an asphaltic cement having high ductility and readily affected by change of temperature.

Its use lessens the resiliency of most bituminous concretes, and should be used with discretion. Not over 4 per cent by weight should be added to any bituminous concrete mixture and a screening of the combined aggregate should show not over 6 per cent of 200-mesh material. If an asphaltic cement is used having finely divided mineral matter self-contained this should be taken into consideration in the determination of total dust.

Bituminous Cement

The bituminous cement may be either asphaltic cement or refined coal tar.

Asphaltic Cement

The asphaltic cement may be prepared from the following asphalts, combined with flux as hereinafter specified if flux is necessary: (1) From refined natural asphalt; (2) from the residue obtained in the careful distillation, either with or without oxidation, of asphaltic or semi-asphaltic petroleum; (3) from any uniform combination of the preceding materials, together with a suitable flux, if flux be necessary, such combination being subject to the approval of the engineer.

Each bidder must state the nature and origin of the bitumen to be used by him, and, further, shall submit samples of the bitumen with his proposal.

The asphaltic cement shall pass the requirements designated below:

(1) It shall have a penetration of from 40 to 65 at 77 degrees Fahr. for use on streets where there is much heavy traffic and where it is desired to have a hard, exceedingly stable pavement. The penetration shall be from 50 to 100 at 77 degrees Fahr. for use on streets or roadways where the traffic is medium and where a resilient, non-slippery pavement is an important consideration. (The above penetrations are measured in hundredth centimeters with a No. 2 needle weighted with 100 grams acting for 5 sec.)

(2) When 20 grams of the cement are maintained at a temperature of 325 degrees Fahr., for five hours in a tin box 2½

inches in diameter, there must not be volatilization of more than 3 per cent by weight of the bitumen present, nor shall the original penetration be reduced thereby over one-half.

(3) The bitumen of the asphaltic cement shall give upon ignition not more than 15 per cent of fixed carbon for asphaltic cement of penetration between 65 and 100, and not more than 16½ per cent for asphaltic cement between 40 and 65.

The method of test employed is that recommended by the committee on coal analysis of the American Chemical Society.

(4) Of the bitumen of the asphaltic cement which is soluble in carbon disulphide, 98½ per cent shall be soluble in carbon tetrachloride. In this test for carbenes the asphaltic cement to be tested should be allowed to stand over night covered with purified carbon tetrachloride. The test to be performed in subdued light.

(5) At 32 degrees Fahr. the bitumen of the cement shall have a penetration of not less than 8 when tested one minute with the needle weighted to 200 grams.

(6) The cement shall not flash at a less temperature than 350 degrees Fahr., New York State closed oil tester.

Flux

The fluxing material may be a paraffine, a semi-asphaltic, or an asphaltic residuum which shall be tested with and found suitable to the asphalt to be used.

The residuum must have a penetration greater than 350 degrees with a No. 2 needle at 77 degrees Fahr. under fifty grams weight for one second.

A natural maltha may be used if it passes the heat and flash tests specified under "a."

(a) The paraffine residuum shall have a specific gravity of 0.92 to 0.94 at 77 degrees Fahr. It shall not flash below 350 degrees Fahr. when tested in the New York State closed oil tester, and shall not volatilize more than 5 per cent of material when heated five hours at 325 degrees Fahr. in a tin box 2½ inches in diameter, as officially prescribed.

(b) Semi-asphaltic residuum shall have the same general characteristics as paraffine residuum except that it shall have a specific gravity of 0.94 to 0.98 at 77 degrees Fahr.

(c) Asphaltic residuum shall have the same general characteristics as paraffine residuum except that the specific gravity shall be not less than 0.98 nor more than 1.04 at 77 degrees Fahr.

Coal Tar Cement

The coal tar cement shall be residue of the distillation of coal tar only, and shall be refined for the special purpose of making a paving cement.

No mixture of hard pitch with the lighter oils of coal tar will be permitted.

Its specific gravity shall be not less than 1.20 nor more than 1.29 at 60 degrees Fahr.

It shall contain not less than 20 per cent nor more than 35 per cent of free carbon insoluble in benzol.

It shall be free from water as determined by distillation and shall show upon ignition not more than ½ per cent of inorganic matter.

No distillate shall be obtained lower than 338 degrees Fahr. and up to 600 degrees, not less than 10 per cent and not more than 25 per cent of distillate shall be obtained. The distillate shall be of a gravity of not less than 1.03 at 60 degrees Fahr. The residue shall have a melting point of about 165 to 170 degrees Fahr. In making this distillation an 8-ounce glass retort shall be used and the thermometer suspended so that before applying the heat the bulb of the thermometer is ½ inch above the surface of the liquid. The melting point of the pitch shall be determined by suspending a ½-inch cube in a beaker 1 inch above the bottom. The temperature shall be raised 9 degrees per minute from 60 degrees Fahr. The temperature recorded the instant the pitch touches the bottom shall be considered the melting point of the pitch.

PROPORTIONS

The proportions of the various ingredients composing the bituminous concrete shall be approximately three parts of stone to two parts of sand, to which shall be added from 7 per cent to 10 per cent by weight of the bitumen. If stone dust or Portland cement is added to the mixture it shall be in such quantities that a screening of the whole aggregate shall not show more than 6 per cent by weight passing a 200-mesh screen.

The dust or Portland cement should be used only in the following cases: (1) When the traffic is heavy and it is desired to harden and stiffen up the paving mixture, in which case the percentage of bitumen should be increased to about 9 to 10 per cent by weight of the whole mixture; and (2) when a bituminous cement of great ductility and short range of temperature is used, in which case the percentage of bituminous cement should not exceed 9 per cent.

In general, the percentage of bituminous cement used should be varied according to the varying characteristics of the mineral aggregate—the more fine material there is in the mixture the greater the percentage of bituminous cement—and the resulting product should be a tough, pliable, well-filled and waterproof mixture.

METHOD OF MIXING

The aggregate shall be dried and heated in properly designed driers before mixing with the bituminous cement. The driers shall be of the revolving type, thoroughly agitating and turning the materials during the process of drying. When the aggregate is thoroughly dried and heated to a temperature of from 200 to 350 degrees Fahr., depending upon the bituminous cement used, it shall be immediately, before cooling or exposing to moisture, mixed with the hot bituminous cement as hereinafter specified. If stone dust is used it shall be introduced directly into the mixer without passing through the drier.

The bituminous cement shall be melted in a tank arranged so the heat can be properly and easily controlled and regulated. When melted and raised to a temperature of from 200 to 350 degrees Fahr., depending on the bituminous cement used, it shall be combined in the proper proportions with the hot aggregate and immediately mixed in a properly designed mixer with revolving blades until a thorough and intimate mixture of the ingredients has been accomplished, and the particles composing the aggregate evenly and thoroughly coated with the bituminous cement. The mixer shall not be exposed directly to the action of fire.

METHOD OF LAYING

While still hot from the mixer the paving mixture shall be spread evenly on the foundation with hot iron rakes and shovels, so that when compressed with the roller it shall have the thickness specified, with the surface even and true to grade. Along the curb and around manholes, catch basins and other obstructions in the street, where the roller cannot reach, the compression shall be secured by the use of hot iron tampers. The rolling and tamping shall be done as quickly as possible after the material is spread, while still hot and pliable. When the paving mixture is hauled on the street in dump wagons it shall be, when ordered by the Engineer, kept covered with canvas to retain heat, dumped on platforms and shoveled into place and raked to the proper grade. As soon as spread the paving mixture shall be rolled with a tandem steam roller weighing at least five tons and the rolling continued, working lengthwise and diagonally of the street. When the pavement is to be subjected to heavy traffic additional compression in the wearing surface should be secured by the use of a 10-ton roller. Rolling must be steadily kept up and continued until all roller marks shall disappear, and the surface gives indications of no further compressibility.

The paving shall be done continuously, so the number of joints between the hot and cold material may be reduced to the minimum. When it is not practicable to lay it continuously and a joint is unavoidable, the edge of the cold material shall be trimmed down to a rough feather edge, and the surface, where the joint is to be made, painted over with bituminous cement, the hot material raked over the feathered edge and thoroughly rolled. Instead of trimming the cold material, joint strips may be used consisting of strips of canvas about 18 inches wide, with three parallel lines of ¾-inch ropes sewed on the under side about 3 inches apart. The joint strips shall be laid on the feather edge of the freshly raked material with the upper rope at the line where the thickness begins to decrease and the rolling completed on top of the canvas as for finished pavement. A square faced may be used when in the opinion of the engineer it is desirable. The faces of the curb and gutter, iron castings, etc., shall be painted with the bituminous cement before the paving mixture is laid.

SURFACE FINISH

As soon as possible after the rolling of the mixture is finished, and while the surface is still fresh and clean, and, if possible, while warm, a seal coat of bituminous cement of proper consistency to be flexible when cold shall be spread over the surface. It shall be applied while at a temperature of from 200 degrees to 350 degrees Fahr., depending on the bituminous cement used, and evenly spread with rubber squeegees. Only a sufficient coat shall be spread to flush the surface voids without leaving an excess. Immediately over this a top dressing of torpedo sand, fine gravel or stone chips free from dust, which must be thoroughly dry and heated in cold weather, shall be spread and thoroughly rolled into the surface. A small surplus shall be left to be worn in or worn away by the traffic.

In the case of park drives and roadways not subjected to heavy, constant traffic, and where a more grainy and coarse surface is desired, the surface finish specified above may be omitted and the following method of finishing adopted:

As the bituminous concrete is raked to grade and just before the roller comes on it, spread dry stone chips evenly with swinging motions of a shovel, until the surface is barely covered one stone chip deep. Then roll thoroughly as specified in the preceding paragraph relating to method of laying. If bare spots appear under the roller, sprinkle more chips and continue the rolling until the whole surface is fairly covered.

After the sand or stone chips have worn into the surface the street shall be swept, all excess of surfacing material removed and the street left clean.

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Contributions suitable for this paper, either in the form of special articles or of letters discussing municipal matters, are invited and paid for.

Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

MAY 17, 1911

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Modern Road Experiments

During the past year the systematic study of the various new methods of building roads and a comparison of these with the better grades of water-bound macadam, have been carried on very generally in all parts of this country as well as in Europe. On Jauuary 4th we described experiments which are being conducted by the State of Ohio, and from time to time we have referred to those being carried on by the general government in several parts of the country. This week we give at some length the conclusions which may be drawn from a few months' experience on an experimental road in Greater New York.

Possibly of even more value than special experimental roads is the collection of accurate data concerning roads built in the ordinary run of department work, but concerning the construction of which a careful record was kept, and whose durability and serviceability are noted by frequent inspection. Some of the features of experimental roads which are apt to be misleading are referred to in the article concerning the Bronx road; these including a tendency to excessive use of bituminous material and unreliability of cost figures. An excellent idea is that of the Road Board of Great Britain, (see page 703) which requests road engineers to keep careful record of construction methods and conditions of surfaces, details of construction, etc., offering to test bituminous materials used in their construction and submit analyses of them to be recorded as a part of the data for each road.

Association for Highway Improvement

An organization known as the "American Association for Highway Improvement" was organized at Washington, D. C., Nov. 22, 1910, and the headquarters of the society are in that city. The purposes of the organization are stated to be:

To correlate and harmonize the efforts of all existing organizations working for road improvement.

To arouse and stimulate sentiment for road improvement.

To strive for wise, equitable and uniform road legislation in every State.

To aid in bringing about efficient road administration in the States and their sub-divisions, involving the introduction of skilled supervision and the elimination of politics from the management of the public roads.

To seek continuous and systematic maintenance of all roads, and classification of all roads according to traffic requirements, payment of road taxes in cash, and adoption of the principle of State aid and State supervision.

To advocate the correlation of all road construction so that the important roads of each county shall connect with those of the adjoining counties and the important roads of each State shall connect with those of adjoining States.

The Association is not designed to supplant any existing meritorious organizations, but it desires to be looked upon as the clearing-house wherein every organization, from the village improvement club to associations national in their scope, may give each of the others the benefit of their experience, their ability and all the facilities at their command.

Road Building in Delaware

Road work in Delaware is under county supervision, but of the three counties most of the work has been done in New Castle county. During the past two years there has been built 37.94 miles of improved roads in this county. About one mile of these was Amiesite; about one-fourth mile was limestone with a top course bound with heavy asphaltum residuum applied by the penetration method, and about 700 feet was the same with Tarvia X substituted for asphaltum. The first named is reoprted by Commissioner Francis A. Price to have been satisfactory, and the other two to have only one fault—that in places the material comes to the top too freely and makes the surface slippery. Asphaltum oil has been applied to the surface of some roads and allowed to penetrate as it would, and has produced good results in some cases, while in others the road went to pieces under traffic. Calcium chloride applied experimentally to a limestone road was very satisfactory for several months after application.

South Carolina Roads

There are about 46,000 miles of public highways in South Carolina, of which nearly 150 are surfaced with stone, about 3,100 with gravel and about 4,000 with sand-clay. In addition there are a few miles of shell roads. During 1909 and 1910 most of the work was done by convict labor under the direct control of county supervisors. The state makes no direct appropriation whatever for highways.

Sand-clay roads 30 feet wide can be constructed at a maximum cost of about $450 per mile, and are maintained by a floating gang of five convicts going over the roads once a month, making the monthly cost of up-keep per mile about $10.00.

STATE AID IN THE SEVERAL STATES AND TERRITORIES

State.	Name of Official or Department in Charge.	Amount Spent in 1910.		Length of Roads Built in 1910.		Amount Appropriated in 1911.		Work Done in 1910.		Remarks.
		On State Roads.	In State Aid to Towns or Counties.	By State. Miles.	With State Aid. Miles.	For State Roads.	For State Aid.	Nature of	Average Cost.	
Albama	No State aid	.....	.....	...	.....	.....	.....	.....	.....	Bill passed providing for a State Highway Commission.
Alaska	Board of Road Commissioners.	$ 260,000	.....	1843	.....	.....	.....	Wagon roads, winter sled roads & trails.	.....	.....
Arizona	Territorial Engineering Department.	200,000	.....	...	.....	.....	.....	Bridges; locating and grading roads near larger towns.	.....	.....
Arkansas	County Courts.	None	None	...	.....	.....	.....	.....	.....	.....
California	State Dept. of Engineering.	50,000*c*	None	20*c*	None	$ 140,000*d*	None	Mountain roads	$5,000 per mile.	.....
Colorado	State Highway Commission.	.....	$ 46,500	...	.....	.....	$ 50,000	.....	.....	Commission created in 1910.
Connecticutt	State Highway Department.	1,809,530§	.....	223.28§	.....	*h*	*h*	.....	.....	.....
Delaware	Co. State Highway Comm'rs.	.....	22,000§**	...	37.94§**	.....	.....	.....	.....	.....
Florida	No State aid or control.	.....	.....	...	.....	.....	.....	.....	.....	.....
Georgia	State Geologist.	.....	Convict labor	...	.....	.....	.....	.....	.....	.....
Idaho	State Engineer.	.....	.....	None	None	23,750	2,000	.....	.....	Good roads law of 1909 dclared unconstitutional
Illinois	Highway Department.	.....	65,000	...	60*l*	.....	.....	Plain macadam.	0.60	State furnishes only broken stone and engineering.
								Bit. macadam.	0.85	
Indiana	Co. Comm'rs.	.....	.....	...	.....	.....	.....	.....	.....	.....
Iowa	State Highway Commission.	500	.....	...	.....	.....	.....	300 feet of earth road.	881 per mile.	$10,000 a year for office maintenance only. Iowa State College acts as commission.
Kansas	State Highway Engineer.	.....	.....	...	.....	.....	.....	.....	.....	No State appropriation for road improvements.
Kentucky	County Courts.	.....	.....	...	.....	.....	.....	.....	.....	.....
Louisiana	State Board of Engineers.	.....	.....	...	.....	.....	.....	.....	.....	No State aid, except convicts. Under new law State will pay one-half cost of roads.
Maine	State Highway Department.	66,689.81*e*	363,948.93*f*	7.99	112.33	250,000*k*	.....	Block, 2,920 sq. yds.	1.64	Gravel, 88.89 m., $2,623.59; earth, 14.75 m., $2,502.98;
								Macadam, 79,396 sq. yds.	0.58	
								Bit. macadam, 19,280 sq. yds.	1.33	
Maryland	Chairman, State Roads Commission.	1,512,443.62	243,922.08	84	51.13	1,050,000	200,000	Stone macadam	.90	Surface treatments, 3 to 8c.
								Gravel	.47	
								Bit. macadam.	1.10	
Massachusetts	State Highway Commission.	505,000*	.....	81.7	.....	500,000*	.....	18 mi. water bound macadam; 9 mi. bit. macadam; 6 mi. gravel; 14.75 bi. gravel; sand, oil binder; 27.2 mi. "small town" roads.		
Michigan	State Highway Department.	.....	137,327	....	204.38	.....	140,000	Gravel, 54.5%	1,797	.....
								Macadam, 43%		
								all other 2½%	4,529	
Minnesota	State Engineer.	.....	80,000	...	.....	.....	80,000	Earth roads, macadam. 5 mi.	45 to 50c	.....
Missouri	State Board of Agriculture.	.....	75,000	...	.....	.....	300,000*c*	Rock	.47	.....
								Gravel	.27	
Mississippi	County Supvs.	.....	.....	...	.....	.....	.....	.....	.....	.....
Montana	County Supvs.	.....	.....	...	.....	.....	.....	.....	.....	.....
Nebraska	.....	.....	.....	...	.....	.....	.....	.....	.....	No State aid except for bridges.
Nevada	State Engineer.	.....	.....	...	.....	.....	20,000	.....	.....	Laws for highways just going in effect.
New Hampshire	H. C. Hill, State Engineer.	39,757.29	517,866.66	none*a*	194.2	40,000	375,000	Macadam, 57...	6,538.65	.....
								Gravel, 135.8...	3,355.50	
								Bit. macad., 1.4	7,708.72	
New Jersey	Dept. Pub. Rd.	.....	825,148	...	84.9	.....	400,000	.....	.....	.....
New York	Department of Highways.	6,000,000†	.....	531	.....	8,000,000†	.....	350 mi. bit. macadam	11,430	.....
								150 mi. water bound macad...	10,000	
								4¾ mi. gravel...	15,840	
								23.7 mi. brick..	25,300	
								2.5 mi. earth...	2 000	
New Mexico	Territorial Eng.	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Carolina	.....	.....	.....	...	.....	.....	.....	.....	.....	No State assistance except engineering advice by Geological Survey.

* Each county repays total cost of roads within its borders in 4 to 6 years. Maintenance paid by automobile tax (estimated at $350,000 for 1911) and $200,000 appropriation.

† For maintenance and repairs, $1,800,000 in 1910; $1,500,000 appropriated for 1911.

‡ For maintenance, $68,147.84 in 1910, $80,000 in 1911.

§ For biennial period of 1909–1910.

** New Castle County only.

a Amount spent for maintenance. *b* Proposed. *c* Estimated. *d* All bills not signed yet. *e* $39,779.74 furnished by State. *f* $171,701.57 furnished by State. *g* For supplies and equipment. *h* Appropriation not yet made. *i* Tax of 25 cts. per h.p. on all automobiles. *k* Not definite whether for State Roads or State Aid. *l* Stone furnished by State f.o.b. penitentiaries. State machinery used for 30 miles.

STATE AID IN THE SEVERAL STATES AND TERRITORIES—*Continued*

State.	Name of Official or Department in Charge.	Amount Spent in 1910.		Length of Roads Built in 1910.		Amount Appropriated in 1911.		Work Done in 1910.		Remarks.
		On State Roads.	In State Aid to Towns or Counties.	By State. Miles.	With State Aid. Miles.	For State Roads.	For State Aid.	Nature of Work Done.	Average Cost.	
North Dakota	No State control	.....	.....	...	.....	.....	.....	.....	.....	.....
Ohio	State Highway Department.	.....	$558,634	...	47.7	.....	.....	.....	.....	.....
Oklahoma	Highway Dept. (Just created.)	.....	.....	...	.....	.....	*i*	.....	.....	.....
Oregon	.....	.....	.....	...	.....	.....	.....	.....	.....	No supervision over road construction or appropriation.
Pennsylvania	State Highway Commission.	None	919,531.98	None	73.7	$2,000,000*b*	$1,000,000*b*	Macadam Bit. macadam Brick	$11,645.71 15,648.84 13,320.10	.....
Rhode Island	State Board of Public Roads.	$327,897‡	.....	36.5	.....	200,000‡	.....	23.6 mi. water bound macadam; 12.9 mi. bit. macadam.	.....	.....
South Carolina	Dept. of Agriculture, Commerce and Industries.	.....	.....	...	.....	.....	.....	.....	.....	Advisory and statistical only.
South Dakota	.....	.....	.....	...	.....	.....	.....	.....	.....	No State control or aid for highway work. Public supervision by state engineer of public roads on State lands.
Tennessee	Highway Commission.	.....	.....	...	.....	.....	.....	.....	.....	Recommendations for State aid presented to 1911 legislature.
Texas	County Comrs.	.....	.....	...	.....	.....	.....	.....	.....	.....
Utah	State Road Commission.	.....	100,631	...	125.4	.....	190,000	1.14 mi. macadam.	3,797	.....
Vermont	Highway Department.	.....	250,000	...	150	.....	300,000	110 mi. gravel, 40 mi. telford.	.....	.....
Virginia	State Highway Commissioner.	.....	450,000	...	290	.....	300,000	Macadam, 12 ft. wide Gravel, 12 ft. wide Sand, clay	4,734.79 1,219.65 730.63	.....
Washington	Highway Department.	300,000	.....	97	.....	790,000	.....	6.5 mi. water bound macadam; 5.5 mi. bit. macadam; 17.4 mi. gravel; 67.4 mi. earth.	....	.....
West Virginia	State Commissioner of Public Roads.	.....	6,000	None	2⅞	.....	None	Vitrified brick, 2,600 ft Earth road, 9,900 ft	1.93 sq. yds 0.25 sq.yd.	Law repealed in 1911. County commissioners now in charge.
Wisconsin	Highway Div., Wis. Geological and Nat. History Survey.	.....	.....	...	.....	.....	.....	.....	.....	No State aid. New law probable.
Wyoming	State Engineer.	.....	.....	...	.....	10,000*g*	.....	.....	.....	No work done yet

‡ For maintenance, $68,147.84 in 1910, $80,000 in 1911. *b* Proposed. *g* For supplies and equipment. *i* Tax of 25 cents per h. p. on all automobiles.

DATA CONCERNING STATE AID

The above table has been compiled from the latest data obtained directly from the road officials of the several States. In many of the States the appropriations for 1911 have not yet been made, although such delay is adverse to effective and economical work by a highway department. Of the 49 States and Territories, 13 neither give aid to or exercise control over any roads; two aid only by giving services of convicts, and one by giving convict broken-stone; 5 give nothing but engineering services or advice. The other 28 give more or less direct aid; New York State gives almost as much as all the others combined. In 1910 State aid and State construction totaled about $17,000,000, the mileage being 4,278. The work so aided varied from mere grading to bituminous macadam and brick pavements.

PARK ROADS

Construction and Maintenance of Park Roads by Metropolitan Park Commission of Massachusetts—Detail Costs

The work of road construction and maintenance by the Metropolitan Park Commission, which has charge of the State park system in the vicinity of Boston, Mass., is of special interest because the commission was one of the first municipal bodies to adopt treatment of roads with tar and asphalt. In respect to the mileage of roads under its charge the work compares in extent with that of an ordinary city. The problem differs, however, from that of a city in that the work is spread over a wide area. Altogether the commission has 80 miles of formal roadways open to automobiles and other classes of pleasure travel. In addition, there are within the woods reservations almost as many more miles of roadways which are restricted to use by horse-drawn vehicles.

In his annual report for 1910 Chairman William B. de las Casas says that for mere reasons of economy it is necessary to keep the roads in as nearly perfect condition as possible. The increased use of automobiles has so changed the character of the wear and tear upon road surfaces that those rebuilt a few years ago have required entire resurfacing. On account of a public demand the commission withdrew, from November 15 to March 31, its prohibition of the use of roadways by automobiles with chains, and in consequence has made an increased allowance of $14,000 for road repairs.

Chief Engineer John R. Rablin, in his report states that the work of reconstruction, repairs and maintenance of roadways has been carried on upon the same general lines as hitherto by the use of refined tars, residual asphalts and asphaltic oils. The results, he says, have been generally satisfactory.

Some of the items in the accompanying table, taken from the annual report, require a little explanation. Calcium chloride was used for the most part on roads that were shaded by trees. Item No. 30, cost $0.931, is a section of Revere Beach Parkway where the subgrade was very spongy. It was excavated, underdrained and reconstructed with 12 inches of gravel screenings under the macadam surfacing.

Item 22, cost $0.287, is a portion of Middlesex Falls Parkway. The old macadam was scarified, covered with 2 inches of gravel and treated with asphaltic oil, ¾ gallon to the yard, the work being done by direct employment of labor.

Item No. 2, Blue Hills Parkway, cost $0.511, an old macadam roadway; it was scarified and new stone added to crown and shape the surface. Tar was applied by a gravity distributor attached to the rear of a tank wagon; temperature of tar 175° F.; work done by the commission by day labor.

CONCRETE ROADS IN MICHIGAN

Concrete macadam roads have been built in Wayne and Saginaw counties in an attempt to secure roadways which will not ravel under automobile travel nor rut under heavy trucking. The former county has been building these for two years and now has nearly eight miles of two-course concrete macadam roadways. The bottom course or layer is made of limestone concrete mixed one Portland cement, two sand and five broken limestone; the top layer being one Portland cement, two sand and three of crushed cobbles. The combined depth of the two courses is 6½ inches when compacted. The roads are made 15 to 19 feet wide. Saginaw county is constructing several miles of similar roads in which the bottom layer of concrete is mixed 1:2:5, and the top layer 1:2:4, with limestone used in both layers.

Wayne county has built more than five miles of gravel concrete roads laid in one course, the concrete being mixed one cement, two sand and four of gravel.

SUMMARY OF COST OF ROAD REPAIRS AND MAINTENANCE IN 1910, METROPOLITAN PARKS

	Parkway or Reservation.	Length (Ft.)	Width of Roadway. Ft.	Square Yards.	Cost per Square Yard in Detail.							Total Amount.	Remarks.
					Labor. Cts.	Gravel Cts.	Brok'n Stone Cts.	Sand. Cts.	Bituminous Binder or Dust Layer. Kind of Material.	Galls. per Sq. Yd.	Cost. Cts.	Total Cost. Cts.	
1	Blue Hills Parkway.	7,600	36	30,400	.008	..	..	*..	Asphaltoilene (Good Roads Improvement Company).	.21	.016	.024	$ 735.20	Surface treatment
2	Blue Hills Parkway.	1,650	26 & 30	5,500	.103	.	.160	..	Tarite - asphalt (American Tar Company).	2.55	.248	.511	2,811.65	Resurfacing
3	Blue Hills Parkway.	2,000	26	5,778	.118	..	.114	..	Tarine (American Tar Company).	2.43	.200	.432	2,493.58	Resurfacing
4	Charles River Reservation.	9,200	60 & 40	54,220	.022	.002	..	.	Calcium chloride...	. .	.013	.037	1,996.47	Surface treatment
5	Charles River Reservation.	2,100	45	9,578	.031	..	.031	..	Tarvia (Barrett Manufacturing Company).	.60	.053	.115	1,100.06	Surface treatment
6	Fresh Pond Parkway.	2,700	40	12,000	.020	..	..	..	Calcium chloride..	...	.016	.036	427.42	Surface treatment
7	Furnace Brook Parkway.	7,750	36 & 40	31,010	.001	..	..	..	Calcium chloride..	...	.008	.009	292.02	Surface treatment
8	Lynn Fells Parkway.	2,600	40	11,500	.006	..	..	..	Calcium chloride..	...	.030	.036	411.55	Surface treatment
9	Lynn Shore Reservation.	5,900	40	24,256	.004	..	.016	..	Asphalt-oil (Texas Company and Indian Refining Company).	.61	.040	.060	1,457.04	Surface treatment
10	Middlesex Fells Reservation.	2,200	19	4,644	.006	.021	..	..	Liquid asphalt (Indian Refining Company).	.21	.017	.044	204.00	Surface treatment
11	Middlesex Fells Reservation.	....	....	5,777	.008	..	..	..	Calcium chloride..	...	.029	.037	211.55	Surface treatment 5 treatments
12	Middlesex Fells Reservation.	....	....	1,777	.008	..	..	..	Calcium chloride..	...	.011	.019	34.12	Surface treatment 3 treatments
13	Middlesex Fells Reservation.	....	....	6,000	.009	..	..	..	Calcium chloride..	...	.039	.048	289.35	Surface treatment 6 treatments
14	Middlesex Fells Reservation.	....	....	3,400	.007	..	..	..	Calcium chloride..	...	.011	.018	61.02	Surface treatment 3 treatments
15	Middlesex Fells Parkway.	1,450	36	5,800	.037	..	.016	..	Tarvia.....	.64	.055	.108	629.02	Surface treatment
16	Middlesex Fells Parkway.	3,200	36	12,800	.004	..	..	.016	Liquid asphalt....	.327	.027	.047	603.80	Surface treatment
17	Middlesex Fells Parkway.	4,650	25	12,917	.011	..	..	.025	Liquid asphalt....	.40	.032	.068	875.92	Surface treatment
18	Middlesex Fells Parkway.	1,360	32	4,836	.025	..	.020	..	Tarvia.....	.22	.018	.063	305.03	Surface treatment
19	Middlesex Fells Parkway.	2,200	19	4,645	.012	..	..	.020	Liquid asphalt....	.49	.040	.072	335.16	Surface treatment
20	Middlesex Fells Parkway.	1,400	19	2,955	.063	.225	..	.020	Liquid asphalt....	.49	.040	.350	1,034.25	Resurfacing.
21	Middlesex Fells Parkway.	1,000	26	2,889	.094	.	.082	.007	Tarine.....	2.14	.153	.336	971.05	Resurfacing.
22	Middlesex Fells Parkway.	3,400	24	9,067	.066	.206	..	..	Asphalt oil (Standard Oil Company).	.34	.015	.287	2,603.76	Resurfacing.
23	Mystic Valley Parkway.	1,600	36	5,700	†.301	.183	.162	.009	Liquid asphalt....	.34	.027	.682	3,890.34	Reconstruction.
24	Mystic Valley Parkway.	3,850	36	15,400	.179	.245	.179	.008	Liquid asphalt....	.31	.025	.636	9,787.96	Reconstruction.
25	Mystic Valley Parkway.	2,750	36	11,000	.021	..	..	.008	Liquid asphalt....	.31	.025	.054	597.14	Surface treatment
26	Nantasket Beach Reservation.	3,760	40	24,935	.018	.002	..	..	Calcium chloride..	...	.021	.041	1,035.05	Surface treatment
27	Neponset River Parkway.	2,750	26	7,944	.003	..	..	..	Asphaltoilene.....	.33	.023	.026	209.50	Surface treatment
28	Quincy Shore Reservation.	11,800	24 & 40	37,155	.002	..	..	..	Calcium chloride..	...	.014	.016	616.30	Surface treatment
29	Revere Beach Parkway.	4,560	36	18,240	.024	..	.026	..	Tarite-asphalt....	.60	.048	.098	1,786.54	Surface treatment
30	Revere Beach Parkway.	1,200	36	4,800	‡.330	..	.411	..	Tarite-asphalt and Tarvia.	2.38	.190	.931	4,467.62	Reconstruction
31	Revere Beach Reservation.	6,100	40	25,078	.003	..	.006	..	Liquid asphalt....	.16	.013	.022	544.37	Surface treatment (patching)
32	Revere Beach Reservation.	2,000	40	7,556	.013	..	.012	..	Tarite-asphalt....	.43	.039	.064	485.34	Surface treatment
33	Stony Brook Reservation.	13,075	16	23,247	.012	..	..	..	Asphaltoilene.....	.27	.021	.033	764.88	Surface treatment
34	Winthrop Shore Reservation.	5,700	36	20,900	.040	..	.009	..	Tarvia.....	.60	.045	.094	1,966.36	Surface treatment
35	Winthrop Shore Reservation.	400	26	1,022	.180	..	.160	..	Tarvia.....	.78	.060	.400	409.34	Reconstruction.

*Included in labor. †Includes hauling away dead material and rolling subgrade, and laying 712 feet of 6-inch underdrain. ‡Includes excavation and gravel filling for subgrade.

NEWS OF THE MUNICIPALITIES

Current Subjects of General Interest, Under Consideration by City Councils and Department Heads—Streets, Water Works, Lighting and Sanitary Matters—Fire and Police Items—Government and Finance

ROADS AND PAVEMENTS

Will Oil Roads Next Month

Pittsburg, Pa.—The dry and summer-like weather of the past few days has made the macadamized county roads unpleasantly dusty, and as the roads are used by many autoists, homes fronting on these highways are coated inside and out with pulverized limestone. The nuisance was unusually pronounced on Washington and Shannon roads in the Mount Lebanon district, where these roads are lined with fine homes. County Engineer S. D. Foster says that in a few days a carload of calcium chloride will be delivered at Castle Shannon, to be used in front of homes along the county roads in the Mount Lebanon district. Mr. Foster says that will overcome the dust until next month, when a general road-oiling campaign is to be inaugurated. The oiling cannot be started earlier because to make it successful warm days and nights are needed to keep the oil from lumping.

Street Oiling to Stop Dust

Waterbury, Conn.—The first oiling of the streets of Waterbury for the present year will probably be done next week when those in the high service will be treated by the Street Department. The lack of rain has placed many city streets in bad condition, dust an inch thick prevailing on some streets, and a high wind causes much discomfiture.

Oiling of City Streets Begun

Providence, R. I.—The work of oiling the macadam streets upon which the street cars operate has been started by the Daniels Road Oiling Company, of East Providence, which secured the contract for the work at a recent session of the Board of Contract and Supply.

Property Owner Objects to Narrowing Street

Atlantic City, N. J.—City Council's recent action in reducing the width of Maine avenue has been taken into court under certiorari proceedings brought by Watson R. Lewis, owner of a large-sized property in the square where the avenue has been vacated or narrowed. Mr. Lewis wants to have the ordinance, which cuts off 40 feet from the east side of Maine avenue between Madison and Melrose avenues, set aside on several grounds, one of which is that real estate owned by him on the west side of the particular square involved will be depreciated in value by making the avenue narrower. Mr. Lewis contends that one of the chief features of the attractiveness of his property was the 100-foot wide avenue in front of it and that there was no necessity for reducing the width.

Street Must Be Raised to Make Sewer Possible

McKeesport, Pa.—In planning for sewers for the East End district, especially between Riverton and Lincoln Way, City Engineer Smith finds that the city is up against a proposition, and to overcome it the city will sooner or later be compelled to expend between $300,000 and $400,000. Fifth avenue, between the points mentioned, is so low that the usual high waters of the Monongahela River flood it. To overcome this is the problem that now confronts the city. Engineer Smith, reporting to the Street Committee of Councils, says it will be a useless expenditure of money to put down a main sewer in Fifth avenue between these two points, and to repave the thoroughfare as is contemplated. He says the sewer can be put down, but that it will be flooded, and of little use, every time there is a high river. He believes the city should arrange to overcome this. In order to give the committee and Councils something to work on the engineer has prepared a plan, showing Fifth avenue, between Riverton and No. 2 fire station, elevated above the flood stage. At some points the street is shown 13 feet above the present grade, but the engineer says this is necessary. He predicts that sooner or later the city will be compelled to make this improvement.

Oil Sprinkling Given Test

Texarkana, Ark.—The combination oil and water sprinkler recently purchased by philanthropic citizens and business men of the East Side has been used for several days and is giving entire satisfaction. A tank car of heavy oil, purchased by the same men, has been spread over portions of the different streets, furnishing Texarkanians with ample evidence that oiling the streets is one sure way of abolishing the dust nuisance and at the same time improving the road.

Paving Pointers for Fort Smith

Fort Smith, Ark.—Mayor Bourland, City Engineer Reed and Aldermen Howell and Blocker have returned from a trip to Little Rock, Memphis, Shreveport and Dallas to inspect the paving, gather data on the cost and durability of the various kinds of paving and also get data upon municipal government. In describing the different pavements inspected, Mayor Bourland said: "In three of the four cities they are using creosote block to the exclusion of all other kinds of paving material. We were taken over Dallas by the Commissioner of Lights and Water, and find they are giving more attention to their highways in the suburbs than any of the cities we visited. They are tearing up asphalt to put down creosote blocks. Shreveport and Dallas are both using creosote blocks. We saw some that had been down many years, and they were in better shape than the new. The unevenness of the surface of new paving had worn away and the paving was as smooth as the floor of my office. Little Rock is using an asphalt combination they call cement-asphalt, that makes a pretty street, and they say it is very durable. We had a block of it shipped here. I like it equally as well as the creosote block, and it has the additional feature of costing only about one-half as much as the blocks."

Demand for Paving Embarrasses City

Indianapolis, Ind.—"Never before has the demand for street improvements been what it is this year," says City Civil Engineer Henry W. Klausmann. "There may be necessary a special levy, provided for by the new street intersection law, to pay for intersections before the year ends. If not, many of the petitioned improvements cannot be made, because the city treasury will not withstand the cost of all the intersections involved. Several years ago the city government practically had to force street improvements upon the people affected, but now the value of the improvements is realized and they are being demanded faster than the city can supply them." For several months petitions have been pouring into the office of the Board of Public Works for improvements of various kinds in all parts of the city, and it has been found difficult to obtain sufficient money to pay for the street intersections, $25,000 appropriated a few weeks ago already being exhausted, and another $25,000 will be necessary. Mr. Klausmann deplored the passage of the law requiring that street intersections be paid out of the general fund of the city, insofar as it applies to Indianapolis. "For fourteen or fifteen years property owners within half a block of each street intersection have had the cost of that intersection assessed among them," he said, "and now through the new law they are being required to help pay for street intersections throughout the entire city. It is not equitable. Had the city always paid the cost of intersections it would be a different matter; but now property owners who already have paid fo rall street intersections affecting their property directly must contribute to the cost of street intersections in all parts of the city. Of course the city will not always be so greatly hampered in making street improvements because of lack of funds for street intersections as it is this year, for hereafter a special levy can be made to provide sufficient funds for this expense. But this year the law caught the city without any provision for this additional expense and with considerable more than $100,000 to be spent for street intersections."

New York's Street Commissioner Speaks in Minneapolis

Minneapolis, Minn.—That the condition of a city's streets were of its own making—clean or dirty according to the co-operation of its citizens, and that no cleaning system in the world was efficient unless the people themselves made it possible, was declared by William Edwards, Street Commissioner of New York City, at a luncheon of Publicity Club members at Hotel Radisson.

There was no trace of the "Billy" Edwards, football hero of the nineties, in the serious and dignified consideration of an important municipal subject in his address.

It was a city official speaking whereof he knew, from an experience of ten years in the active service of giving clean streets to the 4,500,000 people of New York.

"Clean streets are like clean houses," said Mr. Edwards; "they depend upon the people themselves. If people are public-spirited enough not to throw rubbish about, the acquiring of clean thoroughfares is not difficult, but it does necessitate a system.

"To my mind the best system in the world is the flushing system, such as I am told prevails here and which is impossible in New York.

"In the early morning hours street litter should be swept into the gutters. Hand labor is necessary, of course, to arrange the litter into piles for carting away. This hand labor should continue through the day in the busier sections. Of course the rotary or revolving broom is of little use, unless the streets are wet before it is used. The Board of Estimate in New York is at present considering the installation of a vacuum cleaner or pickup, such as is now used in some cities of Germany.

"Litter pails or deposit boxes in every block are necessary if one would have a clean residence district. People would soon learn to use these and refrain from throwing things on the streets, and pride in the neighborhood would result."

City Makes Fine Showing in Paving

Galveston, Tex.—Nothing adds to the general appearance of a city more than clean, well-lighted and paved streets, good drainage, well-kept and uniform sidewalks.

The improved condition of the streets in Galveston during the past few years is remarked on by almost every visitor. The home people, who witness the changes as gradually made, fail, as a rule, to observe anything out of the ordinary.

The City Engineer's Department has just completed a statement showing the expenditures by the city for public improvements from Jan. 1, 1903, to Feb. 28, 1911, as follows:

Jan. 1, 1903, to Feb. 29, 1904	$115,277.53
Year ending Feb. 28, 1905	88,088.77
Year ending Feb. 28, 1906	123,892.52
Year ending Feb. 29, 1908	156,170.56
Year ending Feb. 28, 1909	222,441.08
Year ending Feb. 28, 1910	333,553.48
Year ending Feb. 28, 1911	331,357.17
Total	$1,491,961.40

Of this sum $251,970.65 was expended for vitrified brick pavement and $297,243.51 for mudshell and crushed rock roadways.

Over 6¼ miles of brick paving was laid and 40 miles of mudshell streets. For concrete and vitrified drains $228,897.58 was expended. Grade raising and filling in addition to Goedhart & Bates contract called for $300,122.61. Creosoted wooden box drains in the west end cost $25,699.02. Of the above $563,433.37 was paid out of the current revenues.

Commissioner Makes Tour Inspecting Roads

Syracuse, N. Y.—"There has been a marvelous improvement in the highways of the State since a year ago, and they were never in nearly as good condition as they are today," declared Deputy Commissioner Frank D. Lyon, of the State Department of Highways, last week. Mr. Lyon is traveling through the State by automobile making an inspection of road work, giving inspection to highways that are being cared for by the towns. He has been from Buffalo through the southern tier of counties, from Albany to Binghamton and from Binghamton to Syracuse, by way of Ithaca and Cortland. About 1,000 miles were covered.

SEWERAGE AND SANITATION

Drinking Fountains for School

Bay City, Tex.—The Civic Club recently made formal presentation to the high school of the sanitary drinking fountains, which have been installed for some time. These fountains are handsome fixtures.

Will Enforce Sanitary Provisions Regarding Cold Storage

Indianapolis, Ind.—Pure milk, pure cream, pure butter, pure cheese and pure cold storage products will be insured to the people of Indiana hereafter if the stringent rules adopted by the State Board of Health at a recent meeting at the State House are enforced to the letter, as the Board contemplates they shall be. The Board adopted three rules which bear on the enforcement of the cold storage law passed by the last Legislature. One of the most important acts of the Board was the defining of a cold storage or refrigerating warehouse, to which the terms of the new cold storage law shall apply. By the ruling of the Board the law will apply to all hotels, restaurants and other places of business employing refrigerating machinery or ice for the purpose of preserving food. In regard to all food kept in cold storage and the length of time it may be kept, it was decided that all such food shall be marked; all marking and stamping or tagging shall be plainly legible and shall show the day, month and year of the date of entrance and removal, in letters and figures not less than three-eights of an inch in height and of a style known as 36-point Gothic No. 8. The letters or figures shall be in black or purple ink, and if the goods are tagged the tag shall be securely fastened on the package by tacks, nails, strings or glue in such fashion that it cannot be detached. All goods on hand at the end of nine months shall be reported to the State Board of Health and inspected and passed as suitable for food in accordance with the provisions of the pure food law before being withdrawn. Such inspection shall be made by the inspectors of the State Board of Health or by other persons designated by the State Food and Drug Commissioner to make such inspection.

Will Inspect a Sewage Plant

McKeesport, Pa.—Arrangements are being made by President Lysle, of Common Council, to take a party of city officials and Councilmen to Washington, Pa., to inspect the sewage disposal plant at that place. This is to be done so that the city fathers will be able to get some idea as to what will be necessary here when the city builds disposal plants, which will be within the next few years. City Engineer Smith has had designed a disposal plant, the work having been done by Leo Hutson, who is drafting plans of the city's sewage system, and the Councilmen will see how these compare with the Washington plant. The trip planned by Mr. Lysle will be made in automobiles and at no expense to the city.

Sanitary Expert Is Probing Rochester

Rochester, N. Y.—Caroline Bartlett Crane, of Kalamazoo, Mich., a sanitary expert, is visiting the city. The primary object of Mrs. Crane's visit is to make what she terms a "sanitary survey of the city." She will also study various phases of life and habits in Rochester.

When interviewed Mrs. Crane said she was not sure she would find anything to criticize there, adding: "Rochester has the reputation of being a very fine city, well conducted and well groomed. If everything is like the little I have seen, there will not be much to comment upon adversely."

Mrs. Crane will remain about 10 days and an informal report of her findings here will be made at a mass meeting to be held in Convention Hall next week. Later she intends making a written report, in which the minutest details will be covered, to the Women's Educational and Industrial Union, upon whose invitation she is in the city.

A Correction

Oil City, Pa.—We desire to apologize to Oil City, Pa., for a statement which appeared in our issue of May 3. The State referred to was Louisiana, but the "La." was changed to "Pa." by the printer, and the mistake escaped our attention.

WATER SUPPLY

Prepares Chart of the Water Supply

Dayton, O.—Consummating a great deal of tedious technical research and figuring, Charles K. Kline, of the City Engineer's Department, has turned over to Service Director Ely a chart of Dayton's water pressures at all of the local elevation points. The chart, or scale, is based upon the unit of 60 pounds pressure at the altitude at which this pressure was found to be nothing at all. This is an elevation of 159 feet. According to these figures, which have been worked out with scientific accuracy, it is found that numerous parts of the city are inaccessible to water service without auxiliary boosters. This situation will be entirely remedied when the new reservoir is placed in operation. Engineer Kline's chart can then be used by simply taking cognizance of the additional pressure which the new supply will afford. The chart was prepared at Director Ely's request to assist builders in making their calculations for water service.

Municipal Water Works Makes Good Showing

Montgomery, Ala.—The Water Works Department, of which Commissioner E. B. Joseph is at the head, announces a collection of nearly $18,000 for the month of April from consumers, which is the biggest showing ever made by the department in a single month since the municipal plant was erected. Commissioner Joseph also announces a cut in expenses of the monthly payroll of this department. The office of superintendent was abolished a short time ago, but the Commission retained his services for a short time until the new order of things is straightened out. When the Superintendent retires from service this well mean a reduction of another $200 a month for the department, bringing the grand total up to $625 per month.

Pure Water by First of June

Montpelier, Ind.—People of this city are delighted that the drilling on the first well put down by the light and water company is coming on so rapidly. The first well is completed. The second one has been begun and the work on both it and the third will be rushed, and it is hoped that by the first of June the pure water can be turned into the mains, and Montpelier for the first time in years have pure water for domestic purposes.

Site Selected for Big Reservoir

Fort Worth, Tex.—The city's big surface reservoir with a capacity of 10,000,000 gallons, will be located on the west fork of the Trinity, one mile above Morgan's bridge and about six miles west of the heart of the city. This recommendation of J. D. Trammell and Dr. T. U. Taylor, of the board of expert engineers appointed to investigate and select a site, was unanimously adopted by the City Commission. The city will at once begin condemnation proceedings to obtain possession of about 3,000 acres of land for the basin itself and the drainage area.

Will Employ Expert for Water Improvements

South Bend, Ind.—Clinton S. Burns, of Burns & McDonald, consulting engineers, of Kansas City, Mo., is expected to return to South Bend soon with a report on water works conditions in the city.

Although all but minor improvements have been held up awaiting a report from the Kansas City man, there is little doubt but that another water works plant will be added to the equipment of the department in the near future. A plat of ground in Portage Park, the property of the city, has been mentioned as a probable site for the new station. Plans for preliminary improvements to north and central pumping stations have already been put into effect in an effort to give the city a sufficient supply of water during the approaching dry season.

Probably the most important improvement expected to result from Mr. Burns' investigations is the building of a thoroughly modern pumping station. The long contemplated improvement was discussed several months ago by the Board of Public Works, but plans were halted when it was decided to allow the Kansas City man to investigate the needs of the system before further action was taken.

Money Received for Filtration Plant Construction

Minneapolis, Minn.—Drafts for $504,015, the proceeds of the sale of water works bonds, have been received by C. A. Bloomquist, City Treasurer. The total represents $500,000, the par value of the bonds, a premium of $15, and $4,000 interest accrued from February 1 to April 13. The buyers were allowed $2,500 to defray the costs of issuing the bonds. The receipt of the money has eased the situation in financing the filtration plant construction and permits of immediate progress in the big construction undertaking.

Big Increase Shown in Water Plant Earning

Knoxville, Tenn.—The books of the Knoxville Water Works Commission show that the net earnings of the plant have increased and the expenses of operating the plant have been reduced. The earnings and expenses for the first four months of 1910 and that of 1911 were compared by William Marfield, treasurer of the commission, so the taxpayers of the city could know whether the plant is a paying proposition to the city. The net income for the first four months of 1911 shows an increase over that of 1910 of nearly $5,000, and the decrease in expenditures during the same period of 1911 and same under 1910 period is $2,866.98.

Given Five Years to Remove Pipes

Columbia, S. C.—The city of Columbia will be given five years to remove the pipes across the Columbia canal, as a result of a resolution passed by the last General Assembly and consented to by Attorney General Lyon. The Attorney General brought action against the city of Columbia to require that the pipes which convey the city water be removed from across the canal. He secured an order in the Supreme Court. Upon petition, the time for removing the pipes was placed at seven months. Appearing before the court, Attorney General Lyon stated that he had consented to the order as provided for by the concurrent resolution. He called the attention of the court to the fact that obstructions across the streams of the State were forbidden by the constitution.

Special Rate in Water

Hutchinson, Kan.—It has been announced at the office of the water company that special reduced rates will be allowed patrons for four months beginning June 1 for sprinkling purposes. It has been the custom of the company to allow special rates during the hottest summer months for the benefit of patrons who want to do a great deal of sprinkling on their lawns. However, heretofore the rate has been regulated so that only the users of a great deal of water are benefited by it, while the majority of the patrons are comparatively small users. It is probable that the company will submit for the approval of the commission a rate that will give a benefit of the reduced rate to the small water user.

To Read Meters Monthly

Denison, Texas.—With a view of eliminating numerous complaints from water consumers and promoting co-operation between the Water Department and the consumers in the city, Superintendent Berry, of the Water Department, is making arrangements to have his men read every water meter in the city every month beginning this month. Heretofore meters have been read quarterly and water bills have been paid quarterly. The bills will continue the same as in th past, but the readings will be made every 30 days. Superintendent Berry has also devised a plan whereby each consumer will know the exact amount of water consumed each month. After the meter reader finishes his work he will fill out a card for the consumer containing a regular form. This card will show exactly how much water has passed through the meter during the month just closed and also the amount consumed during the month previous. At the third reading, or end of the quarter, different colored cards from the two previous months will be given the consumer and the key on the card will allow him to figure just how much his quarterly bill will amount to. It is the belief of Superintendent Berry that this system will in time lessen the number of complaints of overcharge that are made each month to the Council.

LIGHTING AND POWER

Gas Rates Lowered by Ordinance

Jackson, Tenn.—Right to charge consumers a maximum of $1.50 per 1,000 cubic feet for gas for illuminating and fuel purposes, provided a 10 per cent cash discount is allowed the consumer on cash payment of bills at the gas company office on or before the 10th of the month, was granted the Citizens' Gas Light Company by the City Council at its regular monthly meeting. The privilege was conferred by a unanimous passage of an ordinance containing the required provisions. The cost of illuminating gas to the consumer is reduced by the new ordinance from a maximum charge of $2 per 1,000 cubic feet to $1.50. The maximum cost of fuel gas is increased 15 cents per 1,000 feet, but this increase is counteracted by the 10 per cent cash discount clause. The object of the gas company in inaugurating the new policy is to discontinue the two-meter system. A decrease in the cost of operating the plant is realized, and the consumer is thus made to share in the economy plan.

Ornamental Lights for City Park

New Britain, Conn.—The Housatonic Power Company has men at work drawing cables through the underground pipes in Walnut Hill Park to connect up the new lights on the ornamental iron poles which have been placed about the park. The poles are the same design which is used in Bushnell Park at Hartford, and they will work in well with the Park Commissioners' plan to beautify and improve the park each year. Eight of the iron poles have been erected at various locations on the park lawn. Seventy-five watt incandescent lights will be suspended from the poles. The current for the lights will be supplied from the high potential street lighting circuit, which is supplied to New Britain and adjacent towns.

Engineer to Estimate Cost of City Electric Plant

Shreveport, La.—The City Council last week, through recommendation of Commissioner John McCullough, of the Department of Public Utilities, selected Anderson Offutt, electrical engineer, of New Orleans, to make a thorough investigation and estimate the cost of establishing a municipally owned light plant here. He is expected to begin work immediately. The filing of his report will likely result in an election on the question of issuing bonds to build the city a plant as suggested by the citizens' committee, which demanded the employment of an expert to prepare an estimate of the cost.

FIRE AND POLICE

Councils Equip City Auto School for Firemen and Police

Wilkes-Barre, Pa.—Members of the Police and Fire Committees of Councils are to open an automobile school. This decision was arrived at last week when the members of the latter committee agreed to defray half of the expenses incident to purchasing a second-hand auto to be used for instruction purposes in the Police and Fire Departments. In addition to this, the Fire Committee reported favorably the measure recently introduced in Councils by A. C. Laning, requiring that in the future all buildings within the fire limits of the city be erected of either brick, stone or concrete.

Work on Pressure Mains Will Start at Once

Toledo, O.—Service Director Cowell and the Waters & Tansey Company have signed the contract for the high pressure service for fire mains. Piping has been ordered by the contractors and work on the power plant will be started as soon as it arrives.

Fire Department Makes Good Showing

Butte, Mont.—Many interesting and important figures anent the Butte Fire Department are contained in the report of Fire Chief Peter Sanger, which was made public last week. The loss by fire during the past year was $35,816, while the amount of property involved was $2,226,460. The cost of maintaining the department during the year was $71,500, just $35.93 more than the appropriation made by the Council.

New Auto Engine Will Be Put Through Trial Tests

Macon, Ga.—The new automobile fire engine has arrived in the city. The car containing the apparatus was placed as soon as possible and unloaded. It is a very fine machine, something like the one now used by the department, with additional improvements. The new engine will be kept at headquarters and the old one sent to the new fire station in Vineville.

Life Saving Squad New Advance Step

Springfield, Mass.—A squad of fire fighters to be known as the life saving crew, which will be sent to fires in the fastest piece of apparatus in the department, was decided upon by the Fire Commission last week. A new car, equipped with three scaling ladders and a life net, will be obtained by an exchange of apparatus and a money consideration from the Knox Automobile Company. The machine will be a "Model M" 50-horsepower, with dual pneumatic tires, in appearance much like the Squad B car, and will be able to carry a squad of 12 men. These men, Chief Daggett said, would be picked especially for the work for which the new machine is designed. It will be stationed at the Chestnut street house, and, with its speed in excess of any other in the department, will be expected to reach fires in its territory in advance of any other apparatus. Its speed will make it possible for the squad to be on hand ready for life saving work if that is found necessary, and also, the men will be expected to do the regular firemen's work if the saving of lives is not required. The Commission considers the move in keeping with its policy to be not only up to date in its fire fighting methods, but ahead of the times as well. The new piece of apparatus will be the only thing of its kind in existence, and is expected to more than prove its value once it goes into commission.

Police Will Help City Beautifiers

Houston, Tex.—Chief of Police Duff Voss has announced the inauguration of a police campaign to enforce the city's ordinances requiring proper disposition of trash and garbage, the maintenance of clean walks and premises, and the ordinance governing the placing of signs in and over the public streets. The order was passed around among the officers at police headquarters and the police have been notified to warn all violators of the law and to arrest where citizens persist in violations. It is the intention of the department to force the cleaning up of the streets and alleys and to help officially in the "beautifying" campaign inaugurated by public-spirited citizens.

Prevention of Fire Booklet

Rochester, N. Y.—The first edition of 3,000 copies of the booklet on the Prevention of Fire, gotten up by Assistant Secretary Ralph Barstow, of the Chamber of Commerce, has been received at the chamber. The booklets are for free distribution, and will be sent to members of the chamber, the public schools, churches, retail stores, manufactories and wholesalers.

Mine Rescue Men to Drill Firemen

Birmingham, Ala.—With the official announcement that the firemen of Birmingham would be drilled free by the Bureau of Mines Rescue Corps in their smoke rooms is indicated an entirely new benefit that will probably be derived from the location of that institution in this city. A. R. Brown, foreman of the rescue station, announced that he would make an offer to Chief Bennett soon, and that he hoped the firemen would be permitted to take advantage of it. "We drill classes in smoke-filled rooms about once every week," said Mr. Brown. "If the firemen care to, we will drill them free in the work of entering smoke-charged rooms equipped with Government rescue helmets. This service would be beneficial for the reason that at almost any time the firemen may be called upon to enter buildings so filled with smoke as to suffocate them if they are unprotected. If, on the other hand, they are equipped with smoke-proof helmets with air sufficient to last two hours, they can fight fire without danger, and at the same time rescue any persons who may be unconscious from smoke and bring them to fresh air and safety." Mr. Brown said that absolutely no expense would be attached to the drilling, as the Government was interested in drilling firemen the same as miners.

GOVERNMENT AND FINANCE

Progress in Work for Equal Suffrage

Pasadena, Cal.—To some citizens by far the most important results of last week's election was the test vote, or rather expression of opinion on the suffrage question—extending the franchise to include women. It was the first and only opportunity afforded voters of the State to indicate probable action in the pending constitutional amendment known as Senate Bill No. 8, introduced by Senator Charles W. Bell and pushed vigorously and persistently by Assemblyman H. G. Cattell. To say the advocates of equal suffrage are pleased with the result would hardly express the situation; they are more than gratified and surprised that nearly 1,000 voters of this city under trying circumstances freely and enthusiastically signed a pledge to work and vote for success October 10.

Mayor Will Investigate Charter Conditions

Schenectady, N. Y.—Mayor Duryee has concluded that the city charter question needs very thorough investigation, and he has decided to appoint a commission of citizens to investigate the question and to report its conclusions and recommendations to him. Mayor Duryee will appoint a committee of possibly 10 citizens to make a thorough investigation, so that intelligent action can be taken at the proper time. While this committee will be unofficial in character, its recommendations will undoubtedly attract attention both here and in other cities throughout the State. All forms of charters, including the commission plan, will be discussed at the coming conference of Mayors to be held at Poughkeepsie May 25, 26 and 27, and Mayor Duryee is of the opinion that much valuable information will be the result.

STREET CLEANING AND REFUSE DISPOSAL

Would Sprinkle Streets with Disinfectants

Atlanta, Ga.—That disinfectants be used in the big street sprinklers, which both clean the streets and flush the gutters, was the suggestion made at a recent meeting of the Second Ward Civic Improvement Club. They all thought so well of the idea that the resolution will be sent to Council with an urgent request that it be carried out.

Cistern Water for Streets

Beverly, Mass.—The Beverly Street Department, in order to conserve the water supply in Wenham Lake, which furnishes Beverly and Salem with water, pumped water from the old fire cisterns last week to water the streets. An engine from the central fire station was put in commission, and after all the water from the cistern at the Town Hall had been drawn into the watering carts the water in the cistern near the depot was used. As soon as possible a power plant will be installed at Bass River to furnish the water for the Street Department.

Gets Complaints About Street Sprinkling

Syracuse, N. Y.—Complaints have already been made as to the manner in which sprinkling is being done in a number of the streets, and after a conference with some of the Aldermen, Commissioner of Public Works Frank M. Westcott stated that the contracts would be rescinded unless the work is done properly.

To Provide for Disposal of Refuse

Indianapolis, Ind.—Dr. C. S. Woods, secretary of the City Board of Health, and C. A. Schrader, president of the Board of Public Works, have taken up the question of controlling the dumping of waste material and rubbish in the city. It is likely an ordinance will be drawn designating public dumping grounds and providing when waste is to be dumped on private property that a permit must first be obtained, and stipulating that only certain kinds of material may be used. The Board of Public Works has ordered dumping in Fall Creek at Indiana avenue to be stopped, and has ordered Gemmer & Henry, city ash contractors, to remove any ashes they may have dumped at that point. The channel of the stream threatens to be narrowed at that point, but the city is having difficulty in handling the situation, owing to the absence of a law on the subject.

Officials Getting Ready to Take Over Street Cleaning

Washington, D. C.—Preparations for a dustless city are being made as rapidly as possible at the District Building, where J. W. Paxton, Superintendent of Street Cleaning, and Captain Mark Broke, Assistant Engineer Commissioner, are getting ready to take over, as a part of the municipal activities, the entire system of street cleaning now in the hands of contractors. Already the white wing section of the city—that is, the downtown district—is being washed and "squeegeed" just twice as often as it was formerly, and when the District does its own cleaning, without the aid of contractors, it is believed that the entire city will have its streets washed. The appropriation, which becomes available July 1, has an item of a quarter of a million dollars for the cleaning work, and authorizes the Commissioners to do without contractors. As the work will have to continue July 1 right where it left off the night before, horses and apparatus are being bought now. With some of the horses now on hand the "squeegee" machines are being worked in double shifts, while the downtown streets are getting the benefit. District officials believe that the washing and scrubbing treatment is the best thing for asphalt streets and believe that the city will be much better cleaned when the entire District can be treated in that way than it has been by the rotary brush treatment.

Montclair to Install New Garbage System

Montclair, N. J.—A sanitary concrete garbage receptacle is being erected under the direction of Engineer Gerardo Immediato on the Garretson farm in Upper Montclair, which it is thought will, when completed, prevent the escape of all disagreeable odors. It is expected that the improvement will be ready for use within 10 days or two weeks. A water pipe is being laid to the new dump. It is proposed that after the last load is brought to the place each night, whatever residue is left in the tank, not taken by the farmers, will be removed and buried in trenches. The tank and platform will then be washed and covered with a sprinkling of quicklime. It is believed that in this way there will be no possibility of either foul odors or flies. For several years the Montclair officials have contemplated the erection of a garbage incinerating plant. A plot of ground near the center of the town has been secured and may eventually be used for the purpose.

Salt Water to Lay Dust

Atlantic City, N. J.—Salt water taken from the meadow streams will be used by the County Board of Freeholders to rid the county roads of the dust nuisance. The efficacy of salt water was discovered after they had expended thousands of dollars in experiments with oily concoctions. It is said the water from certain sections of the meadows has a hardening effect on the road surface.

Municipal Housecleaning Day at Saratoga

Saratoga Springs, N. Y.—Municipal housecleaning days in Saratoga Springs this year are May 26 and 27. On these days the citizens of Saratoga Springs, in fact, each individual who owns property or occupies it, must have his gutter, lawn, yard and surroundings in general in a neat appearance and in harmony with the laws of cleanliness and decency. By having a municipal housecleaning day Saratoga Springs is taking its place beside the long list of cities, towns and villages that have already established this system and are working it to such a degree of perfection as is largely responsible for the good condition and neat appearance of their streets.

Want Streets Cleaned at Night

Chester, Pa.—Committees representing the Edgmont Avenue Business Men's Asosciation, the West Third Street Business Men's Association and the Board of Trade held a joint meet last week for the purpose of forming a joint committee with instructions to confer with Mayor Johnson relative to the project of having the principal streets flushed at midnight. It was stated that in Baltimore, Scranton and a number of other cities the streets were flushed from the fire hydrants at midnight every night, and as a consequence the highways always presented a strikingly neat appearance and were always in a sanitary condition.

RAPID TRANSIT

School Children May Take Two Rides for Five Cents

Shreveport, La.—President W. F. Dillon, of the Shreveport Traction Company, has announced voluntarily that street car tickets hereafter would be sold to school children at the rate of 2½ cents instead of 3 cents each as heretofore. This reduction was one of the concessions mentioned in the company's transfer proposition, which was defeated at the polls recently.

Trolley Line Gets Franchise Over Mayor's Veto

Chattanooga, Tenn.—An ordinance granting to C. E. James and associates and to his and their heirs, executors, administrators and assigns, the right and privilege to construct, equip and maintain street railway tracks and to run and operate by electricity cars thereon on certain streets in the city of Chattanooga, was passed by the City Council last week over the Mayor's veto. The Mayor's message of veto contained five objections, the first of which was to placing a third track on Walnut street. He says that granting the right for a third track on this street is practically abandoning the street to street car lines. The second objection of the Mayor to the ordinance was the placing of a third track on Market street. The third objection stated was that all franchises for the use of streets should provide that the wires be placed underground. The fourth ground of objection was that the ordinance failed to contain a provision against sale or consolidation and to reserve the right to the city to hereafter grant a franchise for a competing line to operate over the tracks provided for in the ordinance, upon the payment of reasonable charges for such service. The fifth objection was that the ordinance does not guarantee to the city interurban lines.

MISCELLANEOUS

Board Urges Five Playgrounds

Syracuse, N. Y.—Action to facilitate the purchase of sites for five playgrounds was taken by the Board of Education at its meeting last week. It is estimated that about $30,000 will be required to purchase the required properties, and Mayor Edward Schoeneck has declared that he will support any reasonable outlay. In urging the passage of the resolution asking the city to buy the properties on which options have been obtained, or are needed, President Church said that a child had recently been killed near one of the schools where pupils were compelled to play in the streets. This, he declared, was a strong argument for providing playgrounds without further delay.

To Rebuild Famous Bridge

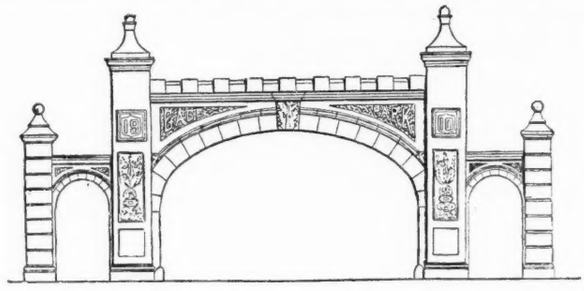
Tarrytown, N. Y.—William Rockefeller has proposed to the taxpayers of North Tarrytown that if they will vote to improve North Broadway he will give $10,000 to pay part of the expense, and will also give $10,000 for rebuilding the famous Pocantico Bridge, known all over the world as the "headless horseman's bridge," made famous by Washington Irving. Mr. Rockefeller has long lived in Irving's country—Sleepy Hollow—and he believes that something should be done in his memory. Next year is the hundredth anniversary of Irving's birth.

City Officials Plan an Exhibit

New Orleans, La.—A conference of the heads of various city departments and organizations was held in the big committee room at the City Hall recently regarding the representation of the city at the Chicago International Municipal Congress to be held in the fall at Chicago. Mayor Behrman had been invited to have the city represented and would have acted on the matter sooner if he had not been ill. However, the various heads had been notified and had the matter in their minds. Mayor Behrman explained the idea of the exhibit that is to be given at Chicago, saying that the various cities will have displays that will represent the different phases of municipal progress. The City Council has authorized Mayor Behrman to arrange for an exhibit from this city, and the meeting was for the purpose of arranging details.

Stone Gateway to Park Completed

Topeka, Kan.—The last stone in the construction of the new $5,000 entrance to Gage Park was laid last week and the archway and mammoth pillars are now ready for public approval. The side wings are yet to be erected. When these are completed the entrance to Gage Park, it is claimed, will surpass that of any park in the West. Even in Chicago the park entrances are inferior when compared to Topeka's new Gage Park structure. In the construction of the new entrance seven cars of cut Bedford stone were used. Some of the massive stones weigh several tons.



NEW STONE GATE FOR TOPEKA PARK

The architecture of the new entrance is beautiful and the high class of workmanship and the finish of the stone gives the entrance a most attractive appearance. The big arch has a 30-foot opening for a driveway, and between the great stone pillars at either side are to be built five-foot arches for the walks. To the east of the entrance is to be built a wing wall of masonry 140 feet in length. This wing will be of Bedford cut stone five feet above a 30-inch concrete foundation. To the west of the entrance will be a shorter wing, but larger stone will be used here. The west wing has a semi-circular effect.

Municipal Ownership of Telephones Endorsed

Ogden, Utah.—At a meeting of the Ogden Chamber of Commerce a unanimous vote was taken in favor of the municipal ownership of local telephones, and a resolution was adopted requesting the City Council to compel the Utah Independent Telephone Company to live up to its franchise, recommending that a copy of the franchise be published in the local papers that subscribers might know to what they are entitled. Another resolution adopted by unanimous vote was in favor of legislative enactment making telephone companies common carriers in Utah.

Boston-1915 Launches Project to Make Civic Center

Boston, Mass.—Boston-1915 has taken up the project of the erection of a building or group of buildings to be centrally located in the city as headquarters for organizations engaged in civic, philanthropic, social or fraternal work. In a letter on this subject that has been issued by James P. Munroe, executive director of Boston-1915, he states that there is a widespread call in Boston for such a building to contain offices, committee rooms, halls and luncheon and dining facilities. Among the organizations interested in such a project he mentions those devoted to business, to civic work and labor interests, improvement associations, fraternal orders, mutual benefit societies, charities, correctional agencies, educational institutions and medical, legal, scientific, engineering and other professional organizations.

Official Gazette Costs City Dear

Spokane, Wash.—The City Commissioners have approved a recommendation for an appropriation of $5,200 for getting out the official gazette for the remainder of 1911. On this basis the gazette will cost the city about $7,000 a year if its circulation does not increase, and in addition the city will have to provide for advertising in newspapers as formerly. Much of the advertising must still be printed in newspapers under the State law. The $5,200 authorized for the gazette includes a salary of $110 a month for nine months for the editor and for 36 issues of the publication at a total cost of $4,210.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Contracts—Performance—Extras

Douglas & Varnum vs. Village of Morrisville.—In assumpsit for extras under a dam construction contract in filling a fissure in the bed of the stream, the declaration sufficiently pleaded waiver of a provision of the contract requiring a written order for extras, where it alleged that the extra work was not contemplated when the contract was made and was treated by the parties as an independent undertaking, and that the owner knew of such extra work while it was being done and when the dam was accepted, etc. If one party to a contract knowingly leads the other, even by silence, to believe when he executes the agreement that a certain construction will be put upon it, he is estopped threby from gainsaying that construction to the prejudice of the other party. A village could waive a provision in a construction contract requiring a written order for extras. A declaration in assumpsit for extras in building a dam is not bad for failing to show compliance with a provision of the contract that disputes should be referred to the owner's engineer, whose decision should be final, where the contractor counts on a subsequent independent verbal agreement concerning the extras. A provision in a construction contract for submission of disputes to the owner's engineer for final decision does not cover disputes not concerning the work itself, but only whether the owner is bound to pay for the work after having received and accepted it. A declaration, under a construction contract, declaring upon an independent subsequent agreement for extra work in consideration of a reasonable price to be paid plaintiffs by defendant is equivalent to an allegation of express promise to pay. —Supreme Court of Vermont, 79 A. R., 391.

Fiscal Management—Warrants—Action

First National Bank of Central City vs. City of Port Townsend, Wash.—The Washington rule that in case of refusal of the treasurer of a municipal corporation to pay a municipal warrant the holder may not maintain an action to recover a judgment on the warrant, but is limited to mandamus to compel the levy of a tax sufficient to pay his claim, is not binding on the federal courts sitting in that State, in which the holder, if entitled to sue therein, may recover a judgment at law as preliminary to enforcement of its warrants by mandamus. A complaint on certain municipal warrants alleged their issuance and the city's refusal to pay the same for lack of funds and averred that the city had neglected to levy in any year since the warrants were issued more than a small fraction of the tax which it was authorized to levy to supply the indebtedness fund with money to pay the warrants and had neglected to levy any tax whatever for that fund in 1909. It did not allege, however, what amount of tax had been collected nor the amount uncollected. Held, that since, under Code, all moneys collected on and after February 1, 1908, for taxes for 1896 and prior years, together with the penalty and interest thereon, were required to be paid into the indebtedness fund, the complaint did not show that the city had broken its contract, or that plaintiff was entitled to mandamus to compel a higher levy to pay the warrants.—United States Circuit Court of Appeals, 184 F. R. 573.

Telephone Franchise—Acceptance

Cumberland Telephone & Telegraph Company vs. City of Mount Vernon.—A city granted to a telephone company a franchise imposing sundry obligations, but for about seven years the company made no attempt to construct or operate a telephone system in the city. An agent was present at the meeting of the City Council which adopted the ordinance, and he requested that it should pass, but it was not shown that he was authorized by the company to accept the conditions of the ordinance. Held, that the company did not accept the ordinance, and an assignment of its franchise passed no rights to the assignee.—Supreme Court of Indiana, 94 N. E. R., 714.

Nuisance—Charcoal Kiln—Abatement

Richards vs. City of Seattle.—That officers of defendant city's health department notified plaintiff that he must cease operating his charcoal kilns unless he installed condensers or retorts within a certain time ,and posted on the kilns notices to the effect that they were unsanitary, and unless put in a sanitary condition would be destroyed, whereupon plaintiff ceased to use the kilns, did not give him a cause of action for damages, it not appearing that the kilns were destroyed, since if the kilns were not a nuisance the notices were of no effect, and if they were defendant would not be liable for abating them. That charcoal kilns located in a city gave off quantities of smoke and at times poisonous gases of itself established prima facie that the kilns were a nuisance. That there were other nuisances or mills located in the same vicinity in a city which gave off the same gases as, and more smoke than, certain charcoal kilns, did not prevent the city from proceeding to abate such kilns.—Supreme Court of Washington, 114 P. R., 896.

Ordinance Regarding Obstruction of Sidewalks

City of New York vs. Leef et al.—New York City Code of Ordinances, enacted by the Board of Aldermen under Greater New York Charter, prohibits any person from obstructing a sidewalk, except as provided in section 262, without written permission from the Borough President; and section 262 prohibits the placing of merchandise, etc., at a greater distance than three feet in front of a store, except goods being loaded or unloaded, and requires a free passageway for pedestrians. Held, that obstructions must be reasonable with reference to the rights of the public, as well as necessary to the business of the person maintaining them, to be justified under the ordinances.—Supreme Court of New York, 128 N. Y. S., 676.

Restraining Diversion of Water—Laches

Wilson, Attorney General, vs. East Jersey Water Company.—Where municipalities have the right to divert the waters of the streams of the State for municipal purposes, the State is not barred by laches from restraining diversion of water of a stream merely because it stood by for many years and allowed a corporation without objection to acquire riparian lands, establish a filter plant and reservoirs, and lay pipes to supply water to municipalities and to divert the water for the municipalities under contracts to supply them with water; the State not having notice of the contents of unrecorded contracts between the municipalities and the corporation.—Court of Chancery of New Jersey, 79 A. R., 441.

Defective Streets—Definition of Negligence

Stokes vs. Sac City.—An instruction that negligence is the doing of an act which an ordinarily prudent person would not do in like circumstances is erroneous, as ignoring the fact that negligence may consist in careless omission to act. —Supreme Court of Iowa, 130 N. W. R., 787.

Interference with Access to Street

Webb et al. vs. Baltimore & Ohio Railroad Company.—Municipal authorities must preserve to abutting land owners as a constituent part of the general public the beneficial enjoyment of streets by access thereto. An abutter suing for interference with access to his property caused by occupation of a street by a railway company must show the extent of his loss as a basis for assessing damages beyond nominal damages. The right of access is the test of an abutter's right of action for occupation of a street by a railroad. A proper method of ascertaining damage resulting to abutters by obstruction of access to their property through occupation of a street by a railroad was to ascertain what it would cost to restore the means of access by devoting part of the property to that purpose.—Court of Appeals of Maryland, 79 A. R., 193.

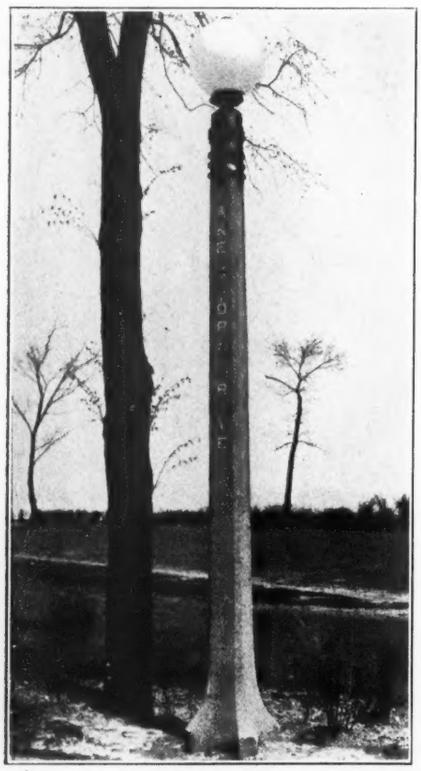
Special Assessment—Installment

Cooney vs. City of Atlanta et al.—An abutting land owner, upon whose property a street assessment is made, is not entitled as a matter of right, under section 150 of the Code of Atlanta, to have his assessment divided into installments, unless the same has been transferred to the contractor doing the work.—Supreme Court of Georgia, 70 S. E. R., 950.

MUNICIPAL APPLIANCES

Concrete Electrolier

M. H. West has recently resigned the position of General Superintendent of the Lincoln Parks System, Chicago, Ill., and has placed on the market through the Western Gardening and Forestry Company, Steinway Hall, Chicago, Ill., a concrete electrolier which he designed. This electrolier, shown in the cut, is artistic, practical and comparatively inexpensive. It has a pleasing, stone-like finish which is permanently retained without the expense of painting. The danger from electrically charged metal is eliminated and the street-marking problem is effectively solved. In parkways especially attractive effects are secured by allowing vines to climb on the posts. The post measures 14 feet from the ground line to the base of

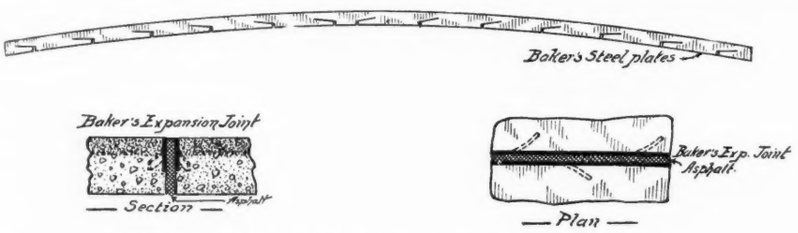


ELECTROLIER AND STREET SIGN

the 20-inch globe, is 9 inches square at the top and 22 inches at the bottom. Aside from the 2-inch pipe conduit, reinforcement is furnished by longitudinal rods conforming with the contour of the post. The globe holder and street-sign letters are of bronze. Either arc lamps or incandescent clusters may be used, the special opalescent globe effectually obscuring the mechanism of the lamp, without perceptibly diminishing the lighting efficiency.

Perfection Oil Distributor

The Perfection oil distributor, placed on the market by the Good Roads Machinery Company, Marathon, N. Y., consists of an inner tank made of heavy boiler plate, enclosed in an outer case. Between the tank and the outer case on all sides and ends there is a fire space varying from 2 inches to 12 inches. All the distributing pipes and aprons are enclosed in a case and surrounded by heat which keeps up the temperature until the material strikes the stone. Wheels and channels are of iron. The rear wheels have an 8-inch and the front wheels a 6-inch tire, thus affording a rolling surface of 28 inches on the road, which enables carrying the load over the work without tearing up the stone and causing ruts. The manufacturers state that by actual test this machine will distribute 300 gallons of material in 30 seconds. The fuel cost of operation per day is about one dollar. The distributor can be regulated for covering any width roadway and for distributing from ½ to 2 gallons of material per square yard. Weight of machine, about 2,400 pounds.



DETAILS OF BAKER ARMORED JOINT FOR CONCRETE PAVEMENTS

Armored Concrete Pavement

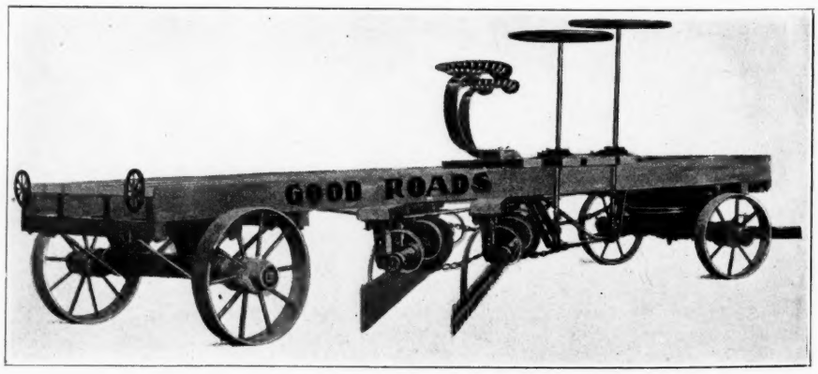
The Thomas Steel Reinforcement Company, Majestic Building, Detroit, Mich., construct a reinforced concrete pavement with specially protected joints which are designed to avoid cracking of the general surface by frost or other causes and prevent chipping from the effects of traffic at the joints that are made to take up expansion. The reinforcing bars of the system are placed at 2-ft. centers at the top of the pavement and at 4-ft. centers at the bottom. At the junction of the 4-ft. spaced rods is a devise called the Thomas support and fastener. These supports and fasteners hold the bars firmly in their proper positions.

At the expansion joints are placed Baker armored joints, shown in the illustration, made by the R. D. Baker Company, 73 Home Bank Building, Detroit, Mich. The Baker armored joints may also be used without the reinforcement. The armor plate consists of a band of steel, the upper edge of which conforms to the contour of the street. Narrow strips or tongues are cut from plate, the free ends being bent alternately to right and left, extending into the concrete on both sides of the joint and forming a bond with it. Asphalt is poured between the plate and the edge of the blocks of concrete on both sides. The result is that expansion is provided for and the steel prevents chipping.

Harrow and Scraper for Roads

The Root Combination Spring Harrow and Scraper, manufactured by the Root Spring Scraper Co., Kalamazoo, Mich., is a device for leveling and smoothing roads. It is especially valuable for use on roads which it is desired to keep up to a high standard of excellence, for it smoothes out the short waves in the roadway. For such work it is said to be very economical, the claim being made by the manufacturers and confirmed by people who have used it that it saves half of the ordinary labor. The illustration shows the general outlines of the machine. The frame carrying the scraper and harrow is 20 feet long. The wheel base is about 18 feet. The scraper blade is 9 feet long, set on an angle of 45 degrees and held in position by springs. The pressure on the springs forcing the blade down is regulated by chains and a wheel in easy reach of the driver. The harrow is operated in the same way. Both can be used together or separately. For light work on ordinary roads one team and a man are all that are required to operate the machine. Where both scraper and harrow are needed at the same time four horses should be used. The hand wheels at the rear of the machine are attached to truss rods and are used for raising or lowering the same and for holding the frame rigid and level. The hand wheels for operating the harrow and scraper are 24 inches in diameter. Any pressure required can be applied to either, as desired, according to the condition of the road.

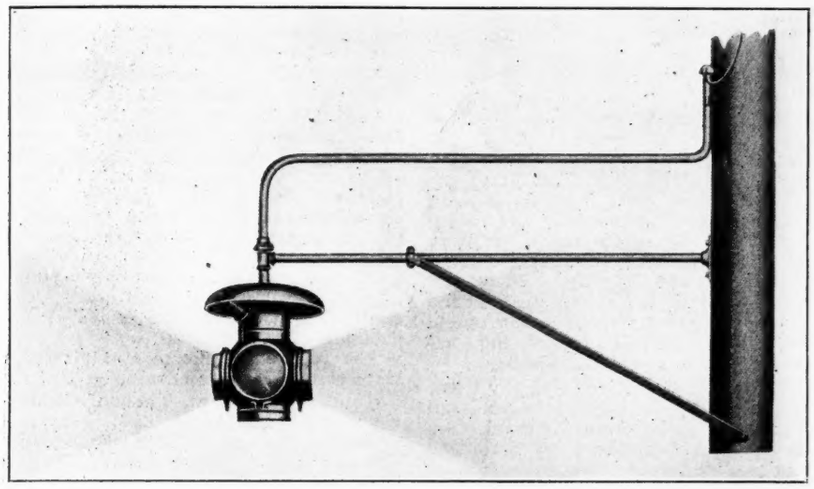
These machines are used by the cities of Kalamazoo, Mich., Dayton, O., the Detroit Driving Club, Detroit Mich.; Troy Driving and Speedway Association, Troy, N. Y.; the Orange County Driving Park Association, N. Y.; Michigan United Railway Company, Jackson, Mich., and others.



HARROW AND SCRAPER FOR HIGH-CLASS WORK

Signalphone Fire and Police Alarm System

The Signalphone Alarm Company, Milwaukee, Wis., manufacture and install separate or combined fire and police alarm systems. Their Bell-light is a device shown in the illustration to provide means for getting into quick communication with patrolmen on their beats, without waiting for them to make their regular hourly or semi-hourly reports. The Bell-light consists of a four way target signal lamp, in



BELL-LIGHT FOR CALLING POLICE OFFICERS

which is located a powerful incandescent light which is controlled from police headquarters. The Bell-lights are also provided with gongs to be sounded in the daytime or foggy weather. The bell serves as a rain-protector for the instrument. The lenses of the light may be green or red; they are 4½ in. in diameter and are located in reflectors on the four sides of the signal lamp. These lights can be installed without a complete police alarm system.

The specifications for the Type 102C fire and police alarm box, shown in the illustration, are as follows: Alarm boxes capable of being used for both departments, each equipped with one headquarters telephone; boxes equipped with trap lock, two keys furnished with each box. All keys uniform; box shells of heavy cast iron, coated with weather-proof enamel paint, having solid brass door hinges; heavy solid brass clock work mechanism, of material which will not deteriorate from the effects of heat, cold or dampness and treated with a coat of finish to prevent corrosion; electro-mechanism protected by a separate dustproof inner case, the face of which is covered with heavy plate glass; mechanism protected against injury from abnormal currents or lightning; means for preventing dangerous electric currents from penetrating exposed metal parts of the instrument with which users may come in contact; instruments to have a high current carrying capacity; means for obtaining instant telephone communication, without depending upon the signaling mechanism; instruments provided with a trip pull hook, encased in a glass covered compartment, and signaling arrangement which can be operated from the outside of the box, without opening the door, which signal is known as the emergency or patrol wagon call; means for transmitting a signal to distinguish the emergency call from other signals; instruments equipped with a variable speed changer and regulator, so that transmission of fire alarms may be timed to conform with the receiving capacity of such instruments as may be used in connection with the service. Boxes arranged so that means at headquarters may be operated to automatically record fire alarms at both fire and police stations simultaneously.

The register indicator for engine house service made by this company is a fine instrument. Fire alarm signals are plainly indicated in Morse characters by ¼-inch holes punched in register paper two inches wide. A permanent record of alarms is thus preserved for future reference.

The register is enclosed in a mahogany case with glass front.

COMBINATION ALARM BOX

Hydraulic Press for Crushing Tests

The Watson-Stillman Company has placed on the market a hydraulic press suitable for testing construction materials, such as hydraulic cement concrete and bituminous concrete, for crushing strength.

This new machine, which we illustrate, is of a common type of hydraulic press, and weighs only 425 pounds, as compared with 3,400 pounds, the weight of material necessary to build the common beam type of machines of equal capacity. The base measures 12 in. by 16 in. and the press is 27 in. high. The cylinder is a steel forging machined to fit down into the reservoir and the pump cylinder is of bronze. This type of testing machine can be carted from place to place on a truck and is also superior to the ordinary compression machines in that all observations can be made by the operator of the pump. He can watch the compression specimen, the pressure gauge and handle the pump simultaneously. This permits rapid work and no waste of time. The operator can also apply the load as rapidly or as slowly as he wishes by corresponding manipulation of the lever. The gauge is graduated to give both the fluid pressure in pounds per square inch and the pressure of the ram on the specimen in tons. A feature of the machine is the ease and quickness with which the ram can be moved to and from the work by means of the lever and connecting links at the left. The small handle at the right furnishes sufficient power where only light pressures are required, while the extension lever applied to this same arm develops pressures up to 30 tons. The platen face is 8 in. square; the platens are 8 in. apart at maximum opening, and the ram movement is 4 in. The machine will therefore accommodate compression cubes or cylinders varying from 4 in. to 8 in. The size to be tested must be left to the discretion of the testing engineer, as it depends upon his estimate of the strength of the mix. A 4-inch cube, which would have to hold 3750 pounds per square inch under a load of 30 tons, is a convenient size for cement and concrete mixtures. The same size would be suitable for asphalt paving mixtures in which sand is the aggregate.

PRESS FOR CRUSHING TESTS

NEWS OF THE SOCIETIES

National Conference on City Planning.—A booklet was issued describing the leading points of interest along the route of the automobile tour of Philadelphia which took place May 15, the first of the three days' session of the third national conference. The booklet is printed with alternate blank pages on the right-hand side for the convenience of the members in jotting down memoranda. A list of the officers of the conference is printed first, then the members of the local committee on entertainment. Then, in addition to city officials, are representatives of the various civic societies. Automobiles for the tour assembled at the Bellevue-Stratford at 9 a. m. The Parkway, from City Hall to Fairmount Park, already in course of construction, was first visited. Other points of interest were visited in order, as follows: Reading Railroad Tunnel, by which grade crossings on 17 streets were eliminated, and other structures eliminating grade crossings; Fairmount Park; Wissahickon Valley; Walnut Lane Bridge; Cresheim Valley; Main Street, Germantown; Pelham; the Chew House; Wyck; Germantown Academy; Happy Hollow Playground; attention will be called to the prevailing type of two-story house which gives Philadelphia the name of "city of homes"; Torresdale Boulevard.

Intermountain Good Roads Association.—The annual convention will be held in Pocatello, Ida., June 22-24. A conference of the State board of road commissioners, in conjunction with the good roads committee of the Salt Lake Commercial Club and representatives of the Utah Development League, was recently held in the offices of Governor William Spry. The following members of the State board are in charge of the campaign for good roads: Governor William Spry, chairman; Caleb Tanner, state engineer, secretary; R. R. Lyman, vice-chairman; J. W. Jensen of Logan and David Mattson of Ogden.

International Firemen's Tournament. The Department of State is in receipt of a dispatch from the American ambassador at Rome, dated April 5, 1911, transmitting a translation of a letter to him from the mayor of Turin inviting American firemen to take part in the international contest to be held in Turin in the Summer during the exposition. In transmitting this communication the ambassador expresses the opinion that possibly some enterprising manufacturer of fire engines may be induced to send over a modern fire engine with a competent force to work it, which might lead to an extensive and profitable foreign trade.

The letter from Senator Theophile Rossi, mayor of Turin, to Ambassador Leishman follows:

"On my last visit to Rome I had the honor of explaining to your secretary the desire of our municipality to have at Turin American firemen on the occasion of the International Fireman's Tournament, which will take place during our exposition.

"For this tournament we are already assured the participation, among others, of French, English and German firemen, and we should be delighted to admire among them firemen of your nation, whose courage and modern system have such a brilliant reputation among us."

Massachusetts Highway Association.—Engineers and superintendents of street construction and maintenance from all sections of the State gathered in Springfield, Mass., May 11 on the occasion of the quarterly meeting of the association. The session was held in the Hotel Kimball, where dinner was served at 1.30 o'clock, followed by a paper and discussion, after which the members were given automobile trips about the city. About 150 members of the association were in attendance. It had been planned to have the meeting in connection with the annual New England conference on street cleaning that is to be held here this month, but the date of the latter was postponed until May 17.

The highway association members convened in Worcester during the morning and made the trip from Worcester to this city in automobiles. About a dozen autos from Springfield were taken to Worcester in the morning to meet the guests and 15 or more cars were provided there, all coming through without mishap. They left Worcester just before 10 o'clock and the advance guard arrived at Springfield about 12:30 o'clock, all being accounted for by 1 o'clock.

Members of the State Highway Commission were in the party and all viewed with satisfaction the good work that has been done the last year on the State roads between Worcester and this city. In Palmer a stop was made to witness a demonstration of an oil distributor on the State highway easterly of the railroad station.

The affair was limited to members of the association, the only guests at the dinner being Alderman Edward S. Goldthwaite and Councilman Edward T. Broadhurst, representing the local board of supervisors. Arthur A. Adams, until recently superintendent of streets, has been a prominent member of the association and was instrumental in having the quarterly gathering held in Springfield, for which he made the arrangements.

Harold Parker, of Lancaster, president of the association, presided at the dinner. The program which followed consisted of a paper by James H. Sullivan, superintendent of streets of Boston.

Halifax County, N. C., Good Roads Association.—At the recent meeting at Weldon the following officers were reelected: President, John L. Patterson, Roanoke Rapids, N. C.; vice-president, Geo. C. Green, Weldon, N. C. The president outlined the work the association had accomplished during the past year in part as follows: The holding of several meetings, changing the road law, securing a law authorizing a bond issue of $300,000, securing lecturers for three addresses on road building, personal work in creating interest in good roads. The president suggested that a map of the county be made, of the expense of which the State and Federal governments will each bear one-quarter.

Natural Gas Association.—The seventh annual convention will be held in Pittsburg, May 16-18. The National Tube Company has arranged for an excursion for the members, May 18, on the steamer Sunshine, visiting the plant at McKeesport. The party will return in the evening so as to give the guests an opportunity of seeing the illuminations from the furnaces and mills along the banks of the river.

Playground Association of America.—The fifth annual meeting was held in Washington, D. C., May 11-13. Playgrounds experts from cities in all parts of the country are gathered to attend the meeting. The secretary's report indicated that playgrounds generally from one end of the country to the other had attracted more attention and received more financial backing than during any previous year of the association's existence. Thirty-two cities now employing 643 workers are actively engaged in playgrounds work. In the past twelve months about $3,000,000 was spent in 184 cities for the improvement and establishment of playgrounds.

The name of the association was changed by a unanimous vote of the attending delegates to the Playground and Recreation Association of America. The change in title was brought about through the efforts of the association's officers for the reason that simply as the Playground Association the organization has outgrown its sphere of work. The association's work now embraces everything pertaining to recreation, in addition to the control and establishment of playgrounds.

The following officers and directors were elected for the ensuing year:

Honorary president, Theodore Roosevelt; president, Joseph Lee; first vice-president, Harold F. McCormick; second vice-presidents, Mrs. Lovell White and William D. Kent; third vice-president, Robert Garrett; treasurer, Gustavus T. Kirby. Directors—Mrs. Caroline B. Alexander, Hoboken, N. J.; Mrs. Samuel A. Ammon, Pittsburg, Pa.; Otto T. Bannard, New York City; Mrs. Emmons Blaine, Chicago, Ill.; Thomas F. Cooke, Buffalo, N. Y.; George W. Ehler, Madison, Wis.; Lee F. Hanmer, New York City; George E. Johnson, Pittsburg, Pa.; Representative William D. Kent, Kentfield, Cal.; Joseph Lee, Boston, Mass.; T. S. Lippy, Seattle, Wash.; Joseph E. Raycroft, Chicago, Ill.; Myron T. Scudder, New Brunswick, N. J.; Seth T. Stewart, Brooklyn, N. Y.; John Wanamaker, Philadelphia, Pa.; Edward J. Ward, Madison, Wis.

International Municipal Congress and Exposition.—An event of interest to officials of cities, contractors and manufacturers who sell goods to cities and citizens who are interested in the way their municipalities are run is promised in the Congress and Exposition in Chicago September 18-30 next. Enterprising citizens of that progressive city have issued a call for all students of city government to assemble at the congress for full discussion of the problems with which cities find themselves confronted. In connection with this the exposition has been arranged at which the foremost cities of the world will exhibit features of their administration and at which equally important exhibits will be shown by manufacturers of every variety of article used in the government of a municipality.

Chicago itself will have an important exhibit. New York will display its budget exhibit. There will be stereopticon views of Berlin. Paris and London will exhibit. Boston, Philadelphia, Cleveland, Toledo and Detroit have arranged to take space. Des Moines will have stucco models of its civic center and river front. Denver, Memphis and New Orleans will be represented. The California League of Municipalities will give a demonstration of what its cities are doing. Spokane and Seattle will exhibit. Moving pictures of Winnipeg will be shown.

American Museum of Natural History.—A special exhibition of apparatus, models, charts and diagrams illustrating the work of the Metropolitan Sewerage Commission and signalizing the inauguration of the Department of Public Health of the American Museum was opened at the Museum, 77th Street and Central Park West, New York City, May 15. Addresses were made by President Osborn, Mayor William J. Gaynor, Dr. George A. Soper, president of the Metropolitan Sewerage Commission; Professor C. E. A. Winslow, curator of the new Department of Public Health of the Museum, and Dr. Harvey W. Wiley, of the United States Department of Agriculture. The exhibition will be open for one month.

National Electric Light Association.—A catalogue exhibit will take the place of the usual exhibition at the convention in New York City, May 29-June 2. The exhibit will be held on the fifth floor of the Engineering Societies' building. Applications for space must reach the secretary not later than May 15.

National Board of Fire Underwriters.—At the forty-fifth annual meeting of the National Board May 11, in the New York Board rooms, No. 123 William Street, the instructing of school children in the importance of handling household combustibles, abolishing of dangerous matches and the punishment of careless cigarette smokers as measures which would greatly reduce the fire losses of the nation, were advocated. A. W. Damon, of Springfield, Mass., president of the organization who urged the instruction for school children, also recommended the enactment of State fire marshal laws by all of the States, modern building laws, legislation to impose stricter regulations regarding the storage of explosives and improved water supply.

Mr. Damon said, in part:

"Nebraska and Montana have followed Ohio in instructing school children as to the importance of observing greater care in the handling and use of those household commodities which are so often the cause of fires. Other States are considering the matter and could well afford to follow the examples of these Commonwealths."

"The Criminal Match" was treated in a resolution introduced by Louis S. Amonson, of Philadelphia, who urged the abolishing of dangerous matches from the household. In another resolution it mas urged that laws be enacted to provide that persons who throw away lighted cigarettes and thereby start fires be held responsible.

M. O. Brown, of New York City, chairman of the Committee on Laws, declared that legislators should devote more time to preventing fire waste by the enactment of laws which would compel citizens to recognize their individual responsibility for fires. George W. Hoyt, chairman of the Committee on Fire Prevention, urged the adoption of a national building code.

These officers were elected: George W. Babb, New York, president; William N. Kremer, New York, vice-president; C. J. Holman, New York, treasurer; E. W. West, Glens Falls, N. Y., secretary; E. H. A. Correa, New York City; E. J. Richards, New York City, and Edward Milligan, Hartford, Conn., members of the Executive Committee. There were 135 insurance companies represented at the meeting.

Calendar of Meetings

May 18-19.
Ohio Society of Mechanical Steam and Electrical Engineers.—Annual Convention, Youngstown.—F. E. Sanborn, Secretary, Ohio State University, Columbus.

May 23-25.
National Fire Protection Association.—Annual Meeting, New York City.—F. H. Wentworth, Secretary, 87 Milk St., Boston.

May 23-26.
National Good Roads Association.—Fourth National Good Roads Congress, Birmingham, Ala.—J. A. Rountree, Secretary, Birmingham, Ala.

May 25-26.
League of Second and Third Class Cities of New York.—Poughkeepsie, N. Y.

May 29-June 2.
National Electric Light Association.—New York City.—T. C. Martin, Secretary, 31 West 39th St.

June 5-14.
National Probation Officers' Association.—Boston, Mass.—Roger N. Baldwin, Secretary, 903 Security Building, St. Louis, Mo.

June 6-8.
Engineers' Society of Pennsylvania.—Annual Meeting at State College, Pa.—E. R. Dasher, Secy., P. O. Box 704, Harrisburg, Pa.

June 6-10.
American Water Works Association.—Thirty-first Annual Convention, Powers Hotel, Rochester, N. Y.—John M. Diven, Secretary, 14 George street, Charleston, S. C.

June 7-14.
National Conference of Charities and Correction. — Boston, Mass. — Alexander Johnson, Secretary, Ft. Wayne, Ind.

June 7.
National Association for the Study and Prevention of Tuberculosis.—Denver, Col.—Dr. Livingston Farrand, Executive Secretary, 105 East Twenty-second street, New York City.

June 11-16.
International Association of Chiefs of Police.—Eighteenth Annual Convention, Rochester, N. Y.—Major Richard Sylvester, Superintendent of Police, Washington, D. C., President.

June 13-18.
New York State Association of Chiefs of Police.—Annual Convention, Rochester, N. Y.

June 13-16.
American Society of Civil Engineers.—Annual Convention, Chattanooga, Tennessee.—Charles Warren Hunt, Secretary, 220 West 57th St., New York.

June 21-22.
National Conference of Poor Law Officials. — Boston, Mass.—Dr. Robert W. Hill, President State Board of Charities, 105 East Twenty-second street, New York City.

June 22-24.
Intermountain Good Roads Association.—Annual Convention, Pocabello, Ida.—Caleb Tanner, State Engineer.

August 15-18.
Firemen's Association of the State of New York.—Watertown, N. Y.—A. H. Otto, Secretary.

September 12-15.
International Association of Municipal Electricians.—Annual Convention, St. Paul, Minn.—Clarence R. George, Secretary, Houston, Tex.

September 18-30.
International Municpal Congress and Exposition.—Chicago, Ill.

September 19-22.
International Association of Fire Engineers.—Annual Convention, Racine, Wis.

September 19-22.
American Hospital Association.—New York City. J. N. E. Brown, M.D., Secretary, Toronto General Hospital, Can.

September 24-30.
International Congress on Tuberculosis.—Rome, Italy.—Professor Ascoli, Secretary-General., Via Lucina, Rome, Italy.

September 26-29.
American Society of Municipal Improvements.—Grand Rapids, Mich.—A. Prescott Folwell, Secretary, 239 West Thirty-ninth street, New York City.

October 4-6.
League of American Municipalities—Annual Convention, Atlanta, Ga.—John MacVicar, Secretary, Des Moines, Ia.

PERSONALS

BEDFORD, L. A., has been elected Mayor of Eastland, Tex.

BRANCH, D. E., was re-elected Mayor of Franklinton, La.

CATLIN, F. M., has been appointed a member of the Board of Police Commissioners of St. Paul, Minn., succeeding Fred N. Dickson, resigned.

CHRISTY, LLOYD B., is the new Mayor of Phoenix, Ariz.

ECKLEY, SHERMAN, has been appointed commissioner of public works of Peoria, Ill. He succeeds George F. Simmons.

EDMUNDSON, C. L., Mayor of Bisbee, Ariz., has resigned.

FIELDS, W. E., has been elected Mayor of Lockhart, Tex.

FREELAND, JOSEPH H., is the new Mayor of Burlington, N. C.

GUNN, SELSKAR M., instructor of bacteriology and public health, Massachusetts Institute of Technology, has been secured by the Milwaukee Bureau of Economy and Efficiency to take charge of the investigation of present health conditions and to work out a final reorganization of the health department. Mr. Gunn is a graduate of the department of biology and public health, Massachusetts Institute of Technology.

HARDING, COLLIN H., was elected Mayor of Washington, N. C., as a result of a very quiet election, there being no contesting candidates.

HUMBER, GEO. H., is the new Mayor of Carthage, N. C.

JOHNSON, JAMES, has been elected Mayor of Raleigh, N. C.

JORDAN, W. S., is the new Mayor of Jacksonville, Fla.

LEDWICH, JAS., has been elected Mayor of Broken Bow, Neb.

KERCH, C. V., has been reappointed City Engineer of Janesville, Wis.

KEYSER, D. S., has been elected Mayor of Napa, Cal.

MCALLISTER, A., Democratic mayoralty candidate of San Luis Obispo, was elected.

MCCARTY, MAJ. JAMES, has been employed as consulting engineer by the Hudson Falls, N. Y., board to report on a new water system.

MATTHEWS, LEE R., is the new Mayor of Pomona, Cal.

MEGUIRE, E. N., was elected Mayor of Portland, Tenn.

MORGAN, W. L., was elected Mayor of Black Mountain, N. C., by a majority of one vote. The voters of that township found that he was a non-resident and the office of Mayor passed to Mr. Morgan's opponent, Mr. W. C. Hall. Morgan's exact status was determined when he went to the polls to vote, the registrar refusing him the privilege to vote on the ground that he was not a resident of Black Mountain township. Subsequent investigation revealed the fact that three months ago Mr. Morgan moved across the corporate limits while his old residence was being torn down to make place for a new one.

MURDOCK, ALLEN C., was elected Mayor of Parkersburg, W. Va.

POUJADE, J., has been elected Mayor of Carson, Nev.

RUARK, J. W., is the new Mayor of Sanford, N. C.

SANDERSON, FRED T., was elected Mayor of Klamath Falls, Ore.

TORNEY, WM. J., is the new Mayor of Vallejo, Cal.

TURRITTIN, R. C., has been elected Mayor of Reno, Nev.

WISE, JOHN W., is the new Mayor of Chester, S. C.

INDUSTRIAL NEWS

Cast-Iron Pipe.—Chicago.—Conditions are decidedly better. Good orders have recently been closed with a number of cities. Prospects for a good pipe season brighter as the year advances. Quotations: 4-inch, $25.50; 6 to 12-inch, $24.50; 16-inch and up, $24. Birmingham—The week has been a very satisfactory one. Prices are firm. Quotations: 4 to 6-inch, $22.50; 8 to 12-inch, $22; over 12-inch, average $21. New York—The demand shows no improvement and transactions are small. Quotations: 6-inch, carloads, $21 to $22.

Lead.—Market is weak. Quotations: New York, 4.40c.; St. Louis, 4.25c.

Wire Brooms.—The Osborn Manufacturing Company, Cleveland, O., has purchased the business and patents of the American Wire Brush Company, 277 Greenwich street, New York. A new office and factory will be established at 202 Centre street, New York Citv. F. D. Jacobs will be in charge of the New York office.

Road Machinery.—To handle more efficiently its increasing business in the Middle West, the Iroquois Iron Works, of Buffalo, N. Y., have established a warehouse in Chicago, where a complete line of macadam and tandem rollers, asphalt tools, kettles, etc., is now carried for immediate shipment. The new shipping depot is in charge of T. H. Morris, the Chicago representative of the Iroqouis Iron Works, with ofces in the Tribune Building.

Water-Sterilizing Plant.—H. A. Canmer of the Seneca Falls Water Works Company, Seneca Falls, N. Y., has replied to a communication from the village officials asking if the company contemplated installing a purification system and asking for a revision of rates. Mr. Carmer replied that, although the water had been pronounced good on several occasions when tested, the company were considering the installation of some sterilizing process when such action was desired. Regarding the rates he said no reduction was possible unless the village sees fit to grant the company a contract.

Oil-Pressure Sprayer.—Street Commissioner McPhetres, Lynn, Mass., recently attended an experimental test of the Standard Oil Company's asphalt oil-pressure sprayer on Johnson Street, Lynn, given by David O'Brien, of Boston, agent for the company. The machine, after a few false starts, appeared to make good the claims made for it by its promoters. As regards costs, they claim that two applications a year will keep a street free from dust at an estimated cost of 2¾ cents per square yard.

Granite Paving Blocks.—Owing to the increased popularity of the granite paving block among city officials granite cutting sheds along the Maine coast have opened for regular production of the standard paving block during the Summer season. The boom in this branch of the State's granite industry was felt in the larger cities of the coast, and many sheds that had felt the business depression for a number of years were started at full capacity. The new paving block is cut with greater care and is smaller than the original. The new block is popular as piece work with the cutters.

Granite Blocks.—The American Granite Company is being organized at Augusta, Ga., with a capital stock of $600,000, for the development of 100 acres of granite property near Augusta. Charles F. McKenzie will be president of the company, which will install a modern plant.

Universal Nozzle.—J. M. Camerson, Johnson City, Tenn., has invented a universal nozzle for use on fire hose. Arrangements are being made for its manufacture, following several successful demonstrations.

Calcium Chloride.—The Solvay Process Company, Detroit, Mich., is engaged in the construction of one of the largest additions to its mammoth plant of any undertaken in this city for several years. The building is an entire steel structure, three stories, and covering about seven acres.

Water-Works Specialties.—The H. W. Clark Company, Mattoon, Ill., manufacturer of meter boxes and other water-works specialties, has beeen incorporated with a capital stock of $50,000. The incorporators are Horace W. Clark, Charles H. Tillotson and Dwight P. Child.

Auto Fire Engine Tested.—The new Robinson automobile fire engine of the Water Witch Fire Company, Wilmington, Del., was given a test last week at West Street and Park Drive, when it gave a good account of itself. Although there was a stiff wind blowing, the engine threw a stream through a nozzle, an inch and a quarter in diameter, a distance of 225 feet, with a water pressure of 150 pounds. This was continued, without variation, for 45 minutes, and could have been continued longer. The stream was siamesed through two lines of hose.

Gasoline Motor Truck.—A decision of the Fire Commission, Springfield, Mass., last week, came as the result of careful investigation by department officials of apparatus used in other cities. An arrangement has been made by the commission with the Knox automobile concern, by which the company offers to build a three-wheeled gasoline tractor for the water tower now stationed at the Pynchon Street house. At present this piece of apparatus is horse-drawn. This tractor, which is an experiment by the Knox people, who have never yet attempted to manufacture this particular class of apparatus, will be furnished to the city for its free use from the time of its completion until March 12, 1912. The commission reserves the right to return it to the company at any time prior to that date, if it so desires, but if it proves satisfactory the purchase will be made.

Reinforced Concrete Sewers.—The bulletin of the Universal Portland Cement Company for May contains illustrations of Meriwether reinforced concrete pipes in course of construction at Niagara Falls, N. Y. The pipes were made in molds furnished by the Lockjoint Pipe Company, New York. R. A. McClanathan was the City Engineer and W. A. Shepard & Co., Niagara Falls, the contractors. The bulletin also contains an illustration of the Dickinson Street reinforced-concrete bridge at Syracuse, N. Y.

General Asphalt Company.—Evidence of the continued success of the present management of the General Asphalt Company is contained in the eighth annual report of the company, for the fiscal year ending April 30. Gross earnings for 1910 were $16,004,173, exceeding the gross of the preceding year by $2,011,190. Net earnings were $1,102,075, as compared to net of $1,031,741 in 1909.

The progress made in the complete rehabilitation of the Asphalt Company's affairs is further evidenced by the fact that the 5 per cent. dividends on the company's $13,140,000 of preferred stock paid during the year make a total cash disbursement for dividends since the company was organized of 20¼ per cent. This, with the 8½ per cent. cumulated dividends (represented by the 5 per cent. debentures issued March, 1911), makes a total distribution of 28¾ per cent. Dividends on the preferred stock became cumulative at the rate of 5 per cent. from June 15, 1905; so that with the payment of the regular 1¼ per cent. on June 1, 1911, 30 per cent., the full dividend for six years past, will have been paid in cash or by debentures.

The Barber Asphalt Paving Company constructed 2,349,917 square yards of new sheet asphalt pavements during the year, and 1,341,047 yards of private work and paid repairs, an increase, taking the two classes of work together, of 560,000 yards over 1909. These figures do not include contracts for 1,687,788 yards carried over to the present year.

Referring to the deduction from net earnings for maintenance guarantee account, the report points out the steady diminution of guarantee periods, which have been reduced from ten years or more to an average of 3.5 years on the work done by the Barber Asphalt Company in 1910. In 1910-11 guarantees expired on more than 7,510,000 yards, on which the average period of guaranteed maintenance was 7.5 years. With the large yardage going out of maintenance each year, accompanied by the adoption of much shorter guarantee periods or their entire elimination, it is pointed out that the company's obligations in this respect will be largely reduced or entirely done away with.

The first public announcement is made in the report of the discovery of immensely valuable oil deposits on the company's property adjoining the Trinidad asphalt lake. A small amount of oil had been obtained up to September of last year, when a well being bored, and then at a depth of 915 feet, began to produce oil at the rate of 3000 barrels a day. With this proof of the existence of an extensive supply of asphaltic oil for fluxing, fuel and road treatment, the company began the construction of storage tanks of 1,000,000 barrels capacity and chartered three tank steamers, the first of which will arrive in this country this month with oil cargoes. The report refers to the finding of the Trinidad oil as "an asset hitherto wholly undeveloped, which is already of proven value, and which possesses great possibilities for the future."

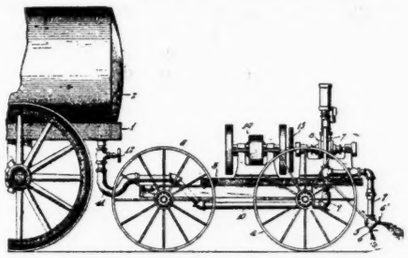
Aside from this oil discovery, the main development in the company's business as shown in the report, relates to the increasing use of asphalt in macadam road construction, the tonnage of Bermudez road asphalt being eight times greater in 1910 than the total for 1909. The outlook for the season of 1911 is considered as very encouraging.

(*Continued on page 738.*)

PATENT CLAIMS

991,043. PROCESS OF MAKING ROADWAYS. Joseph E. Ward, Longbeach, Cal. Serial No. 549,347.

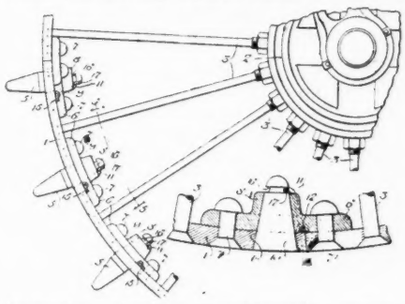
The process of making a roadway which consists in atomizing oil in contact with air in such a manner that the oil tends to remain suspended in the air for an appreciable time, bringing the atomized oil and air into contact with a porous road



surface, causing the oil to permeate the porous road surface while still in atomized condition, and causing the atomized oil to be deposited on the material of the road surface while said material is agitated and partly suspended.

990,846. ROAD ROLLER. Henry F. Crandall, Racine, Wis., assignor to J. I. Case Threshing Machine Company, Racine, Wis., a Corporation. Serial No. 601,619.

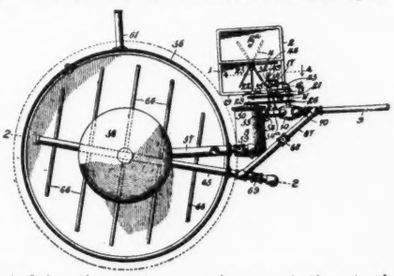
In road rollers, the combination of the roller rim having tapered seats at suitable



intervals extending therethrough, removable spike teeth having tapered shanks fitting said seats, and spring keepers detachably engaging the inner ends of said spike teeth.

991,990. APPARATUS FOR SOFTENING WATER. Axel R. Holmén, Columbus, Ohio. Serial No. 495,033.

An apparatus of the class described including a settling tank, a mixing chamber arranged exteriorly of the settling tank and connected therewith, means for supplying water under pressure to the mixing chamber, a motor connected with and oper-



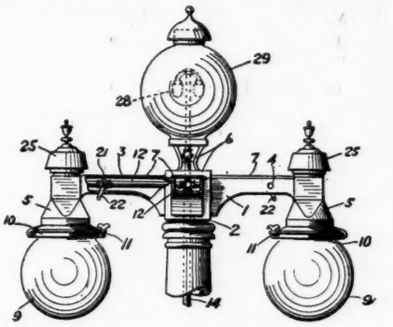
ated by the water supply, a solution tank also arranged exteriorly of the settling tank, a pump operated by the motor and connected with the mixing chamber and having an inlet pipe communicating with the solution tank, and a by-pass pipe extending from the water supply to the inlet pipe.

991,767. APPARATUS FOR PRODUCING OZONE. Charles G. Armstrong, Orange, N. J. Serial No 496,310.

In a device of the class described, a condenser having in combination a plurality of relatively narrow positive and negative conductors, a plurality of solid dielectrics interposed one between each two adjacent conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, means for supplying an electric current to said conductors, and means for forcing air through the spaces between the dielectric plates from one side thereof to the other, whereby the air will cross said conductors transversely and is subjected to but one electrostatic action.

990,680. STREET LAMP. Henry E. Streiber, Canton, Ohio, assignor to The Sun Vapor Street Lignt Company, Canton, Ohio, a Corporation of West Virginia. Serial No. 602,893.

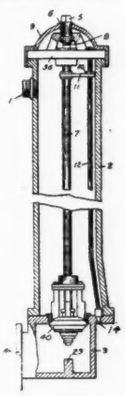
A lamp consisting of the combination of a hollow casting having attaching provisions and having trough-like arms radiating from said attaching provisions and terminating in a vertically arranged outer lamp shell, a globe for closing the lower part of the outer shell, a ventilator at the top of the outer shell, a gas pipe arranged in the arm and



depending through the outer shell and having a regulating valve and radiating air supply pipes or ducts, an inner shell arranged within the outer shell and joined to the top thereof with space between and through which said pipes or ducts extend, said spaces receiving air and supplying the same to the ducts or pipes and to the globe, incandescents or mantles arranged at the lower end of the inner shell, and detachable covers for the trough-like arms.

991,559. FIRE HYDRANT. William H. Symons, San Diego, Cal. Serial No. 586,979.

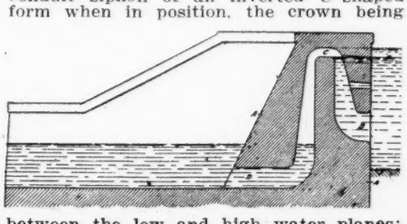
In a fire hydrant, a stand pipe, a funnel-shaped nozzle base extending outwardly from the stand pipe with its small end outwardly; said small end being internally screw-threaded, a nozzle bushing screw seated in the nozzle base and having an external screw-thread on its outer end to receive a hose coupling and having a valve seat upon its inner end, and there being an opening through the opposite side of the stand pipe in alinement with the opening through the bushing; the surface around



the inner end of the opening being finished to form a tight joint, and the surface around the outer end of the opening being finished to receive a lock nut, a valve frame mounted in said alined opening and adapted to form a tight joint with said inner finished base and having an external screw-thread on its outer end and a lock nut on said external screw-thread, so that by removing the bushing and removing the lock nut the valve frame may be removed through the bushing opening.

991,907. SPILLWAY. George F. Stickney, Albany, N. Y. Serial No. 615,736.

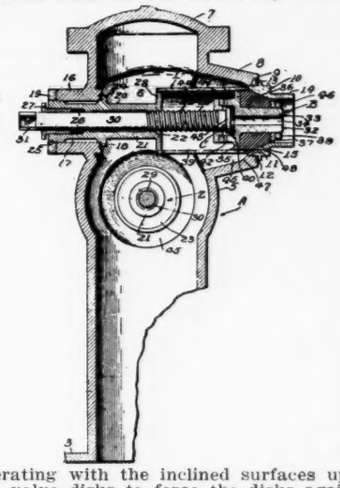
A spillway comprising a dam; a closed conduit siphon of an inverted U-shaped form when in position, the crown being



between the low and high water planes; said dam provided with an air passage extending from at the low water level to a point in the siphon near the crown.

991,690. GATE VALVE. Charles L. Bowker, Brunswick, Me. Serial No. 554,333.

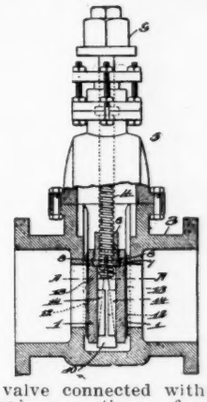
A gate valve, having, in combination, a valve casing, oppositely disposed valve seats in the casing, a valve chamber between said valve seats, valve disks in the valve chamber provided with inclined surfaces on their inner faces, wedge-shaped ribs arranged vertically in said chamber on opposite sides of the water-way and co-



operating with the inclined surfaces upon the valve disks to force the disks against their seats when the disks are lowered, and means located upon opposite sides of the valve chamber operating to force the valve disks away from their seats as the disks are raised, substantially as described.

990,989. FIRE HYDRANT. John Knickerbacker, Troy, N. Y., assignor to Eddy Valve Company, Waterford, N. Y., a Corporation of New York. Serial No. 501,999.

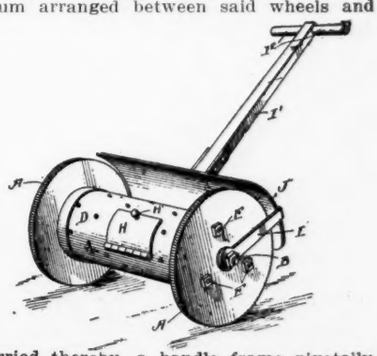
A hydrant comprising a stand pipe, a main valve to control admission thereto, a dash pot carried by said main valve, an



auxiliary valve connected with said dash pot and having a seating surface to further control admission to said stand pipe and a portion on said auxiliary valve arranged to substantially check admission before said seating surface becomes effective.

991,790. DEVICE FOR DISTRIBUTING ASHES AND SAND. Samuel M. Lampke, Detroit, Mich. Serial No. 563,221.

A device for distributing ashes and sand, comprising a pair of wheels having outwardly projecting journals, a perforated drum arranged between said wheels and



carried thereby, a handle frame pivotally mounted on said journals, a handle carried by said frame and a curved apron carried by said handle frame having a length greater than the distance between said wheels.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage, Water Supply and Public Lighting—Fire Equipment and Supplies—Bridges and Concrete Work—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards.

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also corrections of any errors discovered.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREET IMPROVEMENTS				
Ohio	Cincinnati	May 19, noon	Constr. Compton rd. in Hamilton Co.; mac. exten. of Struble rd	Stanley Struble, Pres. Co. Comrs.
New Jersey	Camden	May 19, 8 p.m.	Constructing cement sidewalks and driveways	Joshua C. Haines, Chm. Police Com.
Ohio	Akron	May 19, noon	Paving portions of various streets	John W. Gauthier, Dir. Pub. Serv.
Ohio	Columbus	May 19	Paving portion of Summit St.	H. S. Holton, Dir. Pub. Service.
New York	New York	May 19, noon	Furn. granite stone for bulkhead or river wall	Calvin Tomkins, Comr. Docks.
New Hampshire	Concord	May 19, 1 p.m.	Paving 3½ miles with native stone in the town of Hillsdale and paving 4,500 ft. in the town of Bethlehem	H. C. Hill, State Engr.
New York	Walden	May 19, 8 p.m.	Constructing concrete sidewalks on various streets	City Clerk.
New York	Utica	May 19, 10 a.m.	Oiling two drives of Utica parkway	W. H. Morton, Secy. Park Board.
Pennsylvania	Dormont	May 19, 8 p.m.	Grading, curbing and paving, including 4,700 cu. yds. grading, 3,900 lin. ft. curb and gutter, 4,500 sq. yds. paving	H. M Stilley, Chm. Street Com.
Pennsylvania	Pittsburg	May 19, 10 a.m.	Furn. 100,000 gals. light asphalt road oil; 100,000 gals. heavy asphalt oil; 922,000 brick block for the Crooked Road Run; two all steel tank wagons of 600 gals capacity.	R. J. Cunningham, County Compr.
Illinois	Mendota	May 20, 2 p.m.	Hauling about 5,000 tons of material for constructing gravel rock and macadam roads from railroad and distributing along county roads in Mendota, township	Commissioners Highways.
Indiana	Evansville	May 20, 10 a.m.	Laying and repairing concrete and brick sidewalks	Simon A. Bartholome, Clk. B.P.Wks.
Arizona	Phoenix	May 20	Constr. territorial road from Tucson to Bisbee	Robt. W. Craig, Secy. Bd. Control.
Ontario, Can.	Kingston	May 20, noon	Constructing 6,160 sq. yds. pavement; 2,276 lin. ft. curb and gut	H. B. R. Craig, City Engineer.
New York	Chatham	May 20	Constructing a section of highway known as Rowe Hill	A. P. Tripp, Town Clerk.
Ohio	Cleveland	May 20, 11 a.m.	Grading, draining and improving portion of Settlement Road	John F. Goldenbogen, Clk. B. C. C.
Minnesota	Pelan	May 20, 2 p.m.	Turnpiking and graveling road No. 138	A. P. Erickson, County Auditor.
Ohio	New Philadelphia	May 22	Paving the New Cumberland Road with brick	City Clerk.
Ohio	Cincinnati	May 22, noon	Grade, cement park lot surrounding Public School	C. W. Handman, Business Manager.
Texas	Galveston	May 22, 11 a.m.	Remodeling the Seawall boulevard	John M. Murch, County Auditor.
Iowa	Council Bluffs	May 22, 5 p.m.	Paving curbing and guttering various streets	Chas. J. Duff, City Clerk.
Montana	Great Falls	May 22, 8 p.m.	Constructing concrete walks from June 1 to December 31, about 70,000 sq. ft. 5-foot walk, about 10,000 sq. ft. 15-foot walk	W. P. Wren, City Clerk.
New York	New York	May 22, 10:30 a.m.	Paving with asp. block on conc. found., setting curb and furn. 2,500 cu. yds. of paving sand	Cyrus C. Miller, Pres. Bronx Boro.
Iowa	Fort Dodge	May 22, 9 a.m.	Constr. cement conc. pavement and Portland cement curbing on various streets	W. L. Tang, City Clerk.
Wisconsin	Superior	May 22, 1 p.m.	Building standard cement sidew. 5 ft. wide on various streets	P. J. Ekstrand, Chm. Bd. Pub. Wks.
New York	New York	May 23, noon	Repairing and repaving portions of various roadways	Pres. Boro. Richmond.
New York	Auburn	May 23	Constructing subways in portion of Washington street and paving same with vitrified brick	J. S. Hanlon, City Clerk.
Ohio	Bowling Green	May 23, 1 p.m.	Grading, draining and macadamizing county road	F. W. Tean, County Auditor.
Wisconsin	Janesville	May 23, 2 p.m.	Improving portion of Jackson street	John C. Nichols, Chm. St. Ass. Com.
Tennessee	Memphis	May 23	Constr. 175,000 sq. yds. excavation; 70,000 sq. yds. gravel pavement; 48,000 sq. yds. macadam; 10,000 old stone; 25,000 brick; 70,000 sq. yds. asphalt, wood block or bitulithic	J. H. Weatherford, City Engr.
Ohio	Dayton	May 24, noon	Paving 16 streets and 2 alleys	Budroe, Sec'y Bd. Pub. Service.
Ohio	Marion	May 24, noon	Constr. 1,600 sq. yds. brick pavement; 8,000 sq. ft. sand stone flagging	Chas. M. Tobin, Clk. Bd. Control.
Maryland	Frederick	May 24	Constr. 16,000 sq. yds. of pave. and 8,500 lin. ft. of curb	J. Edw. Schell, Mayor.
New York	Schenectady	May 24, 2:30 p.m.	Repaving various streets and constructing culverts	Harry F. Miller, Secy. Bd. C. & S.
Ohio	Canton	May 24	Paving a mile of road with brick	R. O. Oberlin, County Clerk.
Virginia	Culpepper	May 25, 11 a.m.	Repairs to roadway at National Cemetery	Maj. H. L. Pettus, U.S.A., Wash.D.C.
Ohio	Dayton	May 25	Paving portion of Eleventh st. and two alleys	J. C. Ely. Dir. Pub. Service.
Dist. of Col.	Washington	May 25, 2 p.m.	Furn. asphalt paving blocks, repressed vitr. brick; vitr. invert sewer bricks; red sewer bricks; terra cotta sewer pipe; portland cem. and misc. castings for year ending June 30, 1912	Cuno M. Rudolph, Comr.
Ohio	Youngstown	May 26	Grading and paving various streets	City Clerk.
Ohio	Cleveland	May 27, 11 a.m.	Grad, draining and improving Irish Road No. 2	John F. Goldenbogen, Clk. Bd. C. C.
Indiana	Greencastle	May 27, 2 p.m.	Constr. 8,275 lin. ft. macadam road in Russel township	D. V. Moffitt, County Auditor.
Ohio	Cleveland	May 27, 11 a.m.	Grading and improving portion of Harvard Road	J. F. Goldenbogen, Clk. Co. Comrs.
Mississippi	Hazlehurst	June 1	Constructing 58 miles of gravel roads in Copiah County	The George Company, Ran. Bldg. Memphis, Tenn.
New Jersey	New Brunswick	June 1	Completing by macadamizing and otherwise improving Franklin Park and Kingston road	Asher Bisset, Clk. Bd. Co. Comrs
New Jersey	Laurel Springs	June 3	Construction concrete sidewalk in Washington Avenue	Sam'l L. Burgess, Township Clerk.
Ohio	Willoughby	June 5, noon	Grading, paving and curbing Euclid St.	C. C. Jenkins, Village Clerk.
New Jersey	Cape May	June 6	Constr. seashore road from Seaville to Beesley's Point	Bd. County Comrs.
Indiana	Wabash	June 6, 1 p.m.	Constr. a gravel road in Chester township	J. P. Noftzges, County Auditor.
Indiana	Monticello	June 7, noon	Construct. a rock road on County line bet. White & Carrol Cos.	A. G. Fisher, County Auditor.
SEWERAGE				
Ohio	Akron	May 19, noon	Constr. main and lateral sewers in various streets	John W. Gauthier, Dir. Pub. Serv
New Jersey	Garfield	May 19	Installing sewers	Committee on Sewers.
Ohio	Mt. Gilead	May 19	Furn. 8 to 48-in. culvert pipe	Bd. County Comrs.
Massachusetts	Adams	May 20	Constructing sanitary sewers in various streets	Board Selectmen.
New York	Syracuse	May 22	Constr. the Colvin street trunk sewer and several lat. sewers	Geo. J. Metzpleasure, City Clerk.
Ohio	E Youngstown	May 22, noon	Constructing sanitary sewer	J. P. Carney, Village Clerk.
Iowa	Council Bluffs	May 22, 5 p.m.	Constructing 600 lin. ft. 8-in. sewer; 900 lin. ft. 6-in. lateral sewer, 800 lin. ft. 10-in., 300 lin. ft. 50 in.	Chas. J. Duff, City Clerk.
Wisconsin	Fond du Lac	May 22, 3 p.m.	Constructing sanitary sewer in various streets	J. F. Hohensee, City Clerk.
Alabama	Birmingham	May 22, noon	Constructing a sewerage disposal plant	L. H. Salter, Sanitary Engineer.
Sask., Can.	Moose Jaw	May 22	Building storm sewer extensions requiring in all 9,000 lin. ft. storm sewer; 11,300 lin. ft. 10, 8 and 6-in. vit. tile pipe	J. M. Wilson, City Engineer.
Oklahoma	Muskogee	May 23	Constr. 21,200 ft. of 48-in. sewer pipe; 6,500 of 45-in. and 7,100 of 42-in. Alternate bids for two ring brick with vitrified invert and manufactured concrete pipe	City Clerk.
Ohio	Amherst	May 23	Constr. a small sewer system and sewage disposal plant	C. G. Aschenbach, City Clerk.
Maryland	Frederick	May 24	Constr. about 4,000 lin. ft. 6-in. to 42-in. sewers with inlets, m.h.	J. Edward Schell, Mayor.
Pennsylvania	Williamsport	May 24	Constructing storm water sewers in various streets	J. J. Galbraith, City Clerk.
New York	Binghamton	May 24	Constructing sanitary sewers in various streets, about $15,000.	Board of Contract and Supply
Ohio	Dayton	May 24, noon	Constructing sanitary and storm sewers in various streets	J. C. Ely, Dir. Pub. Service.
Ohio	Piqua	May 25	Constr. about 4,823 ft. of sanitary sewers with 84 house connec.	T. D. McClay, Dir. Pub. Service.
Ohio	Youngstown	May 26	Constructing sewers in various streets	City Clerk.
Kansas	Leavenworth	May 31, noon	Constructing main storm water drain in the college section	Capt. John S. Winn, Act. Q.,U.S.A.
New York	S. Glens Falls	June 1	Constructing a sewer system and disposal plant	C. W. Skym, Village Clerk.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			SEWERAGE (Continued)	
New York	Fort Hamilton	June 2, 11 a.m.	Constructing a sanitary sewer	Constructing Quartermaster.
Ohio	Bellefontaine	June 2	Constr. reduction tank, primary contact beds, outlet drains, etc	Dir. Public Service.
New Jersey	Englewood	June 3, 3 p.m.	Constructing a sewage disposal plant complete	Oliver Drake Smith, Secy. Sew. Com.
Illinois	Ft. Sheridan	June 5, noon	Constr. sewage dis. plant complete, at Fort Sheridan	Capt. M. E. Saville, Constr. Q.M.
New York	Ossining	June 6, 8 p.m.	Constr. the Kill Brook Trunk Sewer; bulkhead dock and screening chamber at outfall end; also other sewers	J. M. Terwillinger, Village Clerk.
California	San Jose	July 3	Construct septic tank for County hospital	City Clerk.
			WATER SUPPLY	
Missouri	St. Louis	May 19, noon	Furn. cast-iron-coated water pipe, special castings, stop valves, post fire plugs and post fire plug top parts	Board Public Improvements.
New York	New York	May 19, 2 p.m.	Furn. and laying water mains in various streets	Henry S. Thompson, Comr. W. S.
Michigan	Marquette	May 20	Building 2 concrete dams on Dead river and other improvements to the hydroelectric plant. Cost about $100,000	Chas. Retallic, Supt. L. & P. Com
Ohio	Silverton	May 22	Laying a 6-in. water main in portions of several streets	A. A. Sprague, Village Clerk.
Minnesota	N. Mankato	May 22, 7:30 p.m.	Constructing a water works system. Alternate bids on electric pumping equipment and gasoline. Separate bids on reservoirs, pump house, pumping equipment, water mains and well	L. Donohue, Village Clerk.
California	San Diego	May 22	Furn. 8,536 lengths of c. i. water pipe from 8 to 36-in.	P. E. Woods, Supt. Water Dept.
Illinois	Stanford	May 22	Constructing water works system	W. C. Murphy, Village Clerk.
Pennsylvania	Etna	May 22, 5 p.m.	Furn. necessary boilers, smoke connections, boiler foundation, stack and stack foundation for Boro. Water Works	J. C. Armstrong, Boro. Clerk.
Ohio	Cincinnati	May 22, noon	Constr. two turbine water wheels in the head house of filtration plant	John J. Wenner, Clk. Bd. Pub. Serv.
Ohio	Youngstown	May 22, noon	Furn. 300 valves from 4 to 36-in. and 108,000 lbs. pig lead	H. S. Holton, Dir. Pub. Service.
Minnesota	Good Thunder	May 22, 7:30 p.m.	Constr. a water tower and connection pipe	A. F. Wendlandt, Village Recorder.
Nebraska	Battle Creek	May 22, 8 p.m.	Constr. a water plant, cost $10,000	Village Clerk.
Ohio	Barnesville	May 22, noon	Laying water pipe and appurtenances in various streets	Edwin Wilson, Chm. Bd. Trustees.
Louisiana	Homer	May 22	Furnishing material for water works	G. G. Gill, Town Clerk.
Ohio	Kenton	May 23	Furn. & install. pump. engine, cap. 2,500,000 gal. per 24 hours.	W. P. Steffen, Dir. Pub. Service.
Ontario, Can	Toronto	May 23, noon	Furn. 3,000 to 3,500 ft. of steel pipe 72-in. in dia. for w. w. intake	G. R. Geary, Mayor.
South Dakota	Vermillion	May 23, 4 p.m.	Constr. a system of water works for the State University	Fred W. Ford, Secy. Regents Edu.
Wisconsin	La Crosse	May 23, 2 p.m.	Furn. 2,375 pieces c. i. pipe from 6 to 24-in.; 90,725 lbs. cast-iron specials, 24 hydrants, valves etc.	Jas. T. Day, Chm. Bd. Pub. Wks.
New York	New York	May 23, 11 a.m.	Completing the Hudson siphon	Board Water Supply.
Virginia	Ft. Meyer	May 25, 11 a.m.	Constr. about 2 miles of 10-in. water mains	Capt. Warren W. Whiteside, C. Q.M.
New York	Cortland	May 25, 8 p.m.	Constr. a standpipe or water tank 50 ft. high and having storage capacity of 1,000,000 gals	Board Water Commissioners.
Ontario, Can	Harriston	May 25	Excavating and pipe laying for water works system	City Clerk.
Missouri	Pleasant Hill	May 25	Constructing a water works including 1,500 ft. 8-in.; 10,000 ft. 6-in., 7,500 ft. 4-in. pipe; lake covering 100 acres; 220 gal. per minute motor driven pumps and 50,000 gal. tank on 50-foot tower	H. K. Willis, City Clerk.
California	Los Angeles	May 26	Furn. fabricated steel and rivets necessary to con. abt. 1,865 ft. of 9-ft. 3-in. and 8,313 ft. of 11-ft. riveted steel syphon	Board of Public Works.
Ohio	Toledo	May 26, noon	Furn. rotary pump, 15,000,000 gals. daily; also bituminous coal gas producer and accessories, about 400 h.p. continuous capacity	Fred Shane, Sec'y Bd. Pub. Service.
Ontario, Can	Ottawa	May 29, 4 p.m.	Constr. a dam and spillway at Kipewa Village, Pon. Co., Quebec.	R. C. Desrochers, Secy. D.P.W., Ott.
Brit. Col., Can	Vancouver	May 31, 4 p.m.	Furn. steel pipe, . i. pipe; also 18-in. flexible joint c. i. pipe	Wm. McQueen, City Clerk.
Wyoming	Ft. Yellowstone	May 31, noon	Constructing pipe line from Panther Creek to Ft. Yellowstone water system	Constructing Quartermaster.
North Carolina	Concord	May 31, 3 p.m.	Building auxiliary pumping station, furnishing turbine pumps and motors; about 2 miles of 12-in. c. i. pipe; 1,000,000 gal. reinforced concrete sedimentation reservoir; 1,000,000 gal. filter plant	Chas. B. Wagoner, Chm. Bd. W.&L.C
Missouri	St. Louis	June 2, noon	Furn. detailed drawing, constructing and erecting at Low Service Pumping station two steam, turbine-driven centrifugal pumping units, complete with condensing apparatus	Board Public Improvements.
Ontario, Can	Toronto	June 6	Furnishing vertically driven pumps	C. H. Rust, City Engr.
Indiana	Richmond	June 12, 10 a.m.	Furnishing water to city for period of 25 years	H. M. Hammond, Chm. Bd. Pub. W.
			BRIDGES	
New York	Little Falls	May 19, 9:30 a.m.	Painting four Mohawk bridges	Matthew A. Leahy, City Clerk.
Ohio	Dayton	May 19, noon	Constr. the substructure, re-erecting the superstructure and rip-rapping the south approach for bridge over Wolf Creek, at its confluence with Great Miamo River	J. C. Ely, Dir. Public Service.
Utah	Moab	May 20	Constructing a bridge over Grand river	A. A. Neff, County Clerk.
Pennsylvania	Harrisburg	May 20, noon	Constr. new concrete bridge over Paxton Creek	Board County Commissioners.
Iowa	Sioux City	May 20, 10 a.m.	Constr. a reinforced concrete abutment on the east end of the West 4th. St. Bridge over Perry Creek	Paul J. Wells, City Clerk.
Ohio	Oberlin	May 22	Constr. superstructure and substruc. of a bridge, at Spring St.	Chas. Chandler, County Clerk.
Pennsylvania	Washington	May 22, 1:30 p.m.	Constructing four reinforced concrete bridges	John H. Moffitt, Co. Comptroller.
Ohio	Lorain	May 22, 1 p.m.	Constr. substructure and superstructure of four bridges	Chas. Chandler, Clk. Co. Comrs.
Ohio	Canton	May 22, 10 a.m.	Constr. the William Geckler Bridge No. 80914A, in Pipe twp.	Bd. County Comrs.
Wisconsin	Fond du Lac	May 22, 3 p.m.	Constr. steel & concr. bridge over west branch of de Neveu Creek	J. F. Hohensee, City Clerk.
New Jersey	Paterson	May 24, 2 p.m.	Building a steel and concrete bridge over Wessel Brook	John H. Kehoe, Chm. County Bd.
Mississippi	Jackson	May 27, noon	Bldg. 2 reinforced conc. arch bridges; 1 steel girder bridge	John J. Pierce, City Engr.
Ohio	Warren	May 29, 1 p.m.	Constr. superstructure of a bridge in Farmington township; 42 ft. roadway, 12-ft. clear	County Comrs.
Ohio	Norfolk	May 29, 10:30 a.m.	Constr. the sub-structure of the Garret Bridge over Marsh Run	County Commissioners.
Ohio	Cincinnati	May 29, noon	Driving piling for the construction of substructure and miscellaneous work in connection with Gilbert ave. Viaduct	John J. Wenner, Clk. Bd. Pub. Serv
Ohio	Hamilton	May 31, 10 a.m.	Constructing a bridge on Sevenmile Pike	I. E. Brate, County Auditor.
Pennsylvania	Pittsburg	June 1	Widening Smithfield Street Bridge, cost about $150,000	City Clerk.
New York	New York	June 1	Strengthening the end spans of the Williamsburg Bridge	Kingsley L. Martin, Comr. of Br.
Pennsylvania	Pittsburg	July 1	Constructing one concrete arch, estimated cost $85,000	City Clerk.
			LIGHTING AND POWER	
Michigan	Marquette	May 20	Building 2 conc. dams on Dead river, cost $100,000	Chas. Retallic, Supt. L. & P. Comn.
New York	Utica	May 23	Furn. 150,000 duct ft. of tile and appur. for an exten. of the electric subways	Board Contract and Supply.
California	Riverside	May 24, 10 a.m.	Selling a franchise, granting right to conduct and operate electric pole and wire system for light, heat and power along all public roads of Riverside County	A. B. Pilch, County Clerk.
New York	Utica	May 24, 2 p.m.	Constructing and extending electric subways, consisting of about 150,000 duct ft, of the tile and appuretances	Stuart F. Day, Secy. Bd. Cont. & S
California	Riverside	May 24	Franchise to run poles and line for conveying electric power on all roads of county.	County Supervisors.
California	Los Angeles	May 29, 2 p.m.	Granting the right for period of 40 years to lay, construct and maintain system of gas pipes under and along roads of Los Angeles County	H. J. Lelande, County Clerk.
New York	Amsterdam	June 6, 8 p.m.	Lighting streets and public places	Thos. Hazlett, Clerk.
Alabama	Eufaula	June 7	Constructing an electric light plant complete	W. L. Upton, Engr. Birmingham.
Georgia	Colquitt	June 10	Improving electric light system to cost $7,500	P. E. Willin, Mayor.
			FIRE EQUIPMENT	
Virginia	Portsmouth	May 24, 7 p.m.	Furn. 2500 ft. of 2½-in. double jacket, rubber lined, cotton hose with brass couplings	L. P. Slater, City Clerk.
Oregon	Astoria	May 27, 8 p.m.	Furn. 1,200 ft. 2½" fire hose for Fire Dept.; 200 ft. for Street Dept	C. E. Foster, Chief Fire Dept.
Dist. of Col	Washington	June 15, 2 p.m.	Furn. one second size, double action steam fire engine	Cuno H. Rudolph, Commissioner.
Dist. of Col	Washington	June 20, 2 p.m.	Furn. 15,000 ft. 2½-in. cotton covered rub. lined fire hose	Cuno H. Rudolph, Commissioner
New Jersey	Princeton	July 5	Furn. auto pumping engine	E. M. Updike, Chm. F. & W. Com.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			MISCELLANEOUS	
New Jersey	Passaic	May 19, 8 p.m.	Install Police Signal, Fire Alarm and Mun. Tele. Exchange	M. B. Matthews, Chm. Com. Pub. S.
Ohio	Mount Gilead	May 19, 11 a.m.	Furn. iron culvert pipe from 8 to 48-in. diameter	Clinton Sipe, County Auditor.
New York	New York	May 19, noon.	Completing an abandoned contract for disposing of all ashes, street sweepings and rubbish that may be delivered on board of deck scows or other vessels at the water front dumps of Dept. of Street Cleaning	W. H. Edwards, Comr. St. Cleaning.
Sask., Can.	Moose Jaw	May 22, 8:30 p.m.	Constructing an incinerator plant	J. M. Wilson, City Engineer.
California	Oakland	May 22, 10-11 a.m.	Constructing City Hall Building, separate bids on 27 items	James W. Nelson, Secy. Bd. Pub. W.
New York	Grand Island	May 22, 2 p.m.	Constr. 500 ft. of conc. retain. wall, 6-ft. high, 12-in. at top, 24-in. at base	John Schutt, Jr., Town Clerk.
New York	New Rochelle	May 23, 8 p.m.	Erecting 2-story fire house	Board Fire Comrs.
Ohio	Youngstown	May 23, 11 a.m.	Renewing part of the floor of the Market St. Viaduct	Will B. Jones, County Auditor.
Ontario, Can.	Toronto	May 23, noon.	Building dock in Ashbridge Bay	G. R. Geary, Mayor.
Maryland	Baltimore	May 24, 11 a.m.	Constr. office and laboratory building at Back River Disposal Works and constr. san. lateral sewers in Dist. 36 A	Calvin W. Hendrick, Ch. Engr. S. C.
Indiana	Indianapolis	May 25	Removing garbage	Chris. Schrader, Chm. Bd. Pub. Wks.
Wisconsin	Cecil	May 25	Constructing new town hall	City Clerk.
Indiana	Indianapolis	May 27, 10 a.m.	Furn. 2,000 ft. of blue prints for County Surveyor's office; paints, brushes etc., for Marion County Jail; 30 tons of coal for guardian's home	Albert Sahm, County Auditor.
Minnesota	St. Paul	May 29, 11 a.m.	Erecting Service and Maintenance building at City and County Hospital	N. P. Langford, Chairman.
Indiana	Evansville	June 1	Furnishing plans for building to be erected in Sunset Park	Simon A. Bartholme, Clk. B. P. C.
Delaware	Dover	June 6, noon.	Constructing wharf	Jas. T. Truax, Pr. Levy Crt., Kent Co.
Nebraska	Imperial	June 6, noon.	Constructing new court house and jail building	M. H. Prall, County Clerk.

STREET IMPROVEMENTS

Decatur, Ala.—Council has passed ordinance for paving Ferry st., Lee to Church st., with asphalt macadam.

Marion, Ala.—Perry County will vote June 10 on $100,000 bonds for building good roads.

East San José, Cal.—Board of Town Trustees has rejected bids for graveling and improving various streets of town; lowest bidder, J. F. Adams, $25,647.45.

Monrovia, Cal.—City will expend $40,000 on street improvements.

Sacramento, Cal.—Commissioner of Streets Walter C. Howe has recommended to Board of Public Works that Washington st. between 2d and 4th sts. be repaved with asphalt pavement on concrete foundation.

Hartford, Conn.—Plans have been received by State Highway Commissioner for proposed road work, as follows: From A. S. Brainard, two sections of road in town of Colchester on Hartford-Norwich turnpipe, aggregating 10,067 ft.; from S. H. McKenzie, 2,950 ft. on Maple st., Cheshire; from W. H. Knight, 1,900 ft. in town of Sherman, and 6,835 ft. in town of Roxbury; from G. E. Smith, 3,800 lin. ft. on West st., town of Seymour, and 3,825 ft. on the New Haven turnpike, in the town of Orange; from F. H. Oldershaw, 4,700 ft. on South Stanley st., in New Britain; from R. G. Pike, Jr., 6,600 ft. on Middlesex turnpike; town of Middletown; from J. S. Dickinson, 9,050 ft. in the town of Lyme; from A. S. Brainard, 17,300 lin. ft. in the town of East Windsor, 8,925 ft. in the town of Hebron, and 33,450 ft. in town of Marlborough.

New Britain, Conn.—City Engineer F. H. Oldershaw has prepared map for extension of subway in Arch st.

Milford, Del.—Town Council has decided to improve remainder of East Front st., South Milford, beginning at Franklin st. and extending to the town limits by putting down macadam; work of building streets will be under charge of Engineer Herbert Hatton, of Wilmington.

Wilmington, Del.—State Highway Commissioner Pierce has been instructed by the Levy Court to prepare specifications for good roads as follows: Mill Creek, from Hendrickson's farm by Telegraph road to St. James' Church, to Newark by Taylor's factory to Union; White Clay Creek, Newark and Elkton road to Maryland State line, Newark and Elkton road by Cooch's bridge road; New Castle, Hare's Corner to city limits of New Castle; Blackbird, Clayton to Cypress bridge; Red Lion, St. Georges to Kirkwood.

St. Petersburg, Fla.—Citizens will vote June 13 on $5,000 bonds for street crossings.

Streator, Ill.—City proposes to lay about 20,000 sq. yds. of brick paving and 5,000 ft. of stone curb.—F. W. Herbert, City Engineer.

Huntington, Ind.—Huntington and Wabash County Commissioners have ordered construction of Ditzler road in Dallas Township at cost of $7,268.

Indianapolis, Ind.—Board of Public Works has asked City Engineer Klausmann to prepare plans for resurfacing Capitol ave., from Washington st. to the Union railway tracks, and Park ave., from St. Clair to 17th st., with asphalt.

Mount Pleasant, Ia.—Hall & Adams, Engineers, Centerville, have been employed as Engineers for about one mile of brick pavements with asphalt filler; work will soon be advertised.

Lake Providence, La.—State Highway Commission will expend $15,000 in improving roads.—Gervais Lombard, Chief Engineer.

Lowell, Mass.—Loan order has been recommended by Street Committee for paving of the following streets: Belvide, Knapp ave., $4,750; Summit st., $1,325; Stackpole st., $2,000, and Mansur st. from Wentworth ave. to Parkview ave., $925; Centralville, Lilley ave. from West 6th st. to Lakeview ave., $2,350; Dalton st., Lilley ave. to Ennell st., $600; West 6th st. Ennell st. to Lakeview ave., $2,350; Otis st., Moore st. to Angle, $1,075; North st., $975, and Bourne st., Andrew st. to Angle, $375; Washington st., $3,000; Pawtucketville, Moody st., Bridge to 6th ave., $5,550, and Riverside st., from Moody st. to Bodwell ave., $4,850.

Buchanan, Mich.—Town and Township are considering $50,000 bond issue for good roads.

Duluth, Minn.—Cost of improving West 5th st., 23d to 25th st., has been estimated at $3,222.

Stillwater, Minn.—Board of County Commissioners has set aside from general road and bridge fund sums to be expended in towns under direction of the Supervisors as follows: Stillwater township, $400; Afton, Cottage Grove, May, Forest Lake, Denmark, Oneka, New Scandia and Woodbury, $300 each; Lakeland, Grant, Baytown, $250 each, and $250 on Briggs road on line between Grant and Stillwater townships.

Virginia, Minn.—City Engineer E. F. Johnson has submitted to Council plans for paving of several avenues and streets.

Bay St. Louis, Miss.—Hancock County has issued $25,000 bonds for road improvements.

Missoula, Mont.—City contempletes paving of business district and has sent a committee of five business men to make inspection of paving and street improvements in cities of Northwest.

Columbia, Mo.—Council has ordered plans for 6,000 sq. yds. brick pavement, also for pipe sewers to cost about $4,000.—J. Russell Ellis, City Engineer.

Atlantic City, N. J.—Council has approved plans and specifications for paving New Jersey ave., Magelan ave. to Clam Creek, and for Massachusetts and other avenues.

Camden, N. J.—County Board of Freeholders will improve Camden and Westfield turnpike and resurface White Horse turnpike, West Collingswood to Berlin.

Elmer, N. J.—Salem Freeholders have been petitioned for State road from this town to Mullica Hill.

Montclair, N. J.—Bloomfield ave. will be paved with granite block at a cost of $100,000.

North Wildwood, N. J.—Citizens have voted $60,000 bonds for street improvements.

Pitman, N. J.—Council has voted to extend Holly ave. to the Washington Township line, at which point Gloucester County Freeholders will build bridge over Bethel Creek and township will extend street to the Glassboro and Woodbury road.

Trenton, N. J.—Board of Freeholders has decided to improve Trenton, Lawrenceville and Princeton road at cost of $30,000.

Buffalo, N. Y.—Cost of repaving Lancaster-Alden road with brick has been estimated at $59,500.

New York, N. Y.—Two macadam roadways in Riverside Drive are to be repaired by the Park Department with asphalt binding for their entire length.

New York, N. Y.—Board of Aldermen has approved resolutions providing for an appropriation of $400,000 toward work of extending Riverside Drive north of 105th st. to connect with the Henry Hudson Memorial viaduct; also $400,000 toward widening, regrading, repaving, recurbing and otherwise improving 42d, 23d, 34th and other streets.

Syracuse, N. Y.—Council will at once ask for bids for paving Canal st., Pearl st. to Oswego Canal, at cost of $3,200.

Hamlet, N. C.—Town has voted $50,000 bonds for street improvements.

Salisbury, N. C.—Iredell County has voted $400,000 bonds for general road building.

Cincinnati, O.—County Commissioners have ordered repair of Zig Zag road, Cooper ave. to Madison road, at cost of $8,430.

Columbus, O.—All bids have been rejected for paving Summit st., Eleventh ave. to Mock road; new bids will be asked.

Girard, O.—Council has decided to pave Liberty st. from State st. to railroad tracks.

Middlefield, O.—Harlan Sperry, Village Engineer, has been instructed to prepare plans for paving portions of Elm, Main and North sts.

Eastvale, Pa.—State Highway Commissioner Hunter has notified Council to have the preliminary survey made of street that is affected by petition to the State for paving and grading and to forward same to Harrisburg.

McKeesport, Pa.—City is considering paving of Walnut st. at cost of $20,000.—J. M. Smith, City Engineer.

Zelienople, Pa.—Town is planning additional street paving.

Pawtucket, R. I.—Special Commission has estimated cost of eliminating grade crossings within city at $1,220,247.

Pawtucket, R. I.—Board of Aldermen has passed joint resolution appropriating $1,000 for improvement of Elmdale ave. and $850 for Japonica st.

Woonsocket, R. I.—Board of Aldermen has passed resolution appropriating $1,500 for bitulithic pavement in Clinton and Cumberland sts.

Brady, Tex.—Voters of Voca, Mount Tabor and Lost Creek Districts have petitioned for election on $10,000 bonds to improve roads.

Marlin, Tex.—Council is considering paving of Live Oak st.

Quitman, Tex.—Wood County has voted $30,000 bonds for road improvements.

Seattle, Wash.—Board of Public Works has adopted plans for grading New Tenth ave.

Spokane, Wash.—Council has approved plans for grading, curbing and sidewalking Jefferson st., Wellesley to Garland ave., at an estimated cost of $13,275; grading, curbing, parking and sidewalking 23d ave., Wall to Jefferson st., at cost of $7,100.

Spokane, Wash.—Council has approved plans, and bids will be asked for grading, curbing, parking and sidewalking of Lidgerwood st., Liberty to Rowa, at cost of $27,500; also Thirty-eighth ave., Perry to Grand, $9,200; plans were also approved for paving Washington st. at cost of $29,000.

Ronceverte, W. Va.—Citizens will vote on $10,000 bonds for paving Railroad ave. and several cross streets with brick.

Fond du Lac, Wis.—Council has passed resolutions for macadamizing West Scott

st., Main st. to city limits; Rosendale ave., river to city limits; Military st., Western ave. to city limits, and 4th st., Everett st. to city limits.

Medicine Hat, Alta., Can.—Citizens will vote on $4,000 by-law for constructing plant sidewalks, $33,500 for cement sidewalks, $17,500 for curbs, gutters and boulevards and $8,000 for street grading.—A. R. Perry, Secretary.

Chilliwask, B. C., Can.—Ratepayers have passed $76,000 by-law for street macadamizing, $10,000 for drainage and $10,000 for road machinery.

CONTRACTS AWARDED

Long Beach, Cal.—Paving as follows: Park Circle, to White & Gaskill, $21,670, and Elliot st., to A. E. Burns, $22,009.

Los Angeles, Cal.—To L. C. Garnsey, to pave Redondo-Wilmington road, $45,633.

Bluffton, Ind.—Building two stone roads in Jefferson Township, to J. N. Neff, $9,767, and to Chas. Nash, $5,669.

Fowler, Ind.—To P. J. Kennedy, Templeton, by Board of County Commissioners, for construction of Anderson road in Oak Grove Township, $6,900.

Ft. Wayne, Ind.—Paving, to Moellering Construction Co., city, $38,724; to Barber Asphalt Paving Co., work to the amount of $63,868.

Greencastle, Ind.—Paving with asphalt and constructing cement sidewalk four streets around public square, to Madison Construction Co., Anderson, $21,720.

Indianapolis, Ind.—Building macadam pavement in Maple road, to American Construction Co.

Muncie, Ind.—Paving with brick Jackson st., to John Gubbins & Co., $15,305.40; Howard st., to William Birch, $7,158.08; Jefferson st., to William Birch, $939.22; Liberty st., to William Birch, $8,255.82.

Vincennes, Ind.—Improvement of Jefferson ave., to P. W. Lenahan, 1,155 cu. yds excavation, 12c.; 11,628 cu. yds. embankment, 37c.; 3,615 cu. yds. gravel, 80c.; 30,552.6 sq. ft. concrete walk, 10c.; 6,188.6 lin. ft. stone curbing, 42c.; two lines 12-in. sewer, 25c. per lin. ft.

Franklin, Mass.—Furnishing $3,000 road roller, to Buffalo-Pitts Co., Buffalo, N. Y.

Lawrence, Mass.—Building granolithic sidewalks and curb, to Contractor Wagenbach; coal tar sidewalks, to Wm. P. Rae; top dressing, to C. F. & R. M. Bailey.

Pittsfield, Mass.—Laying 4,000 sq. yds. pavement on Allen, School and Fenn sts., to Daniel J. Walsh, Pittsfield, $2.58 per sq. yd.

Springfield, Mass.—Cement sidewalk and curb construction; specifications called for the complete laying of 825 sq. yds. of sidewalk and 5,820 lin. ft. of curbing of Portland cement concrete; to C. W. Streeter, 69 Spencer ave., for sidewalks, including excavating and refilling in cinders, 42c. per lin. ft.; to L. C. Baker, New Britain, Conn., for refilling in sand, 95c. per sq. yd.

Duluth, Minn.—Improving Juniata st. with tarson on concrete base, to E. A. Dahl, $8,249.50.

Hibbing, Minn.—Furnishing 16,000 vit. brick, to C. A. Remington, $22.50 per thousand.

Collins, Miss.—By Road Commission, to Boyd & Bradshaw, 18 miles of road in Beat Three, of Covington County, $9,410.

Fulton, Mo.—To Jos. Pope, Jefferson City, for 9,000 sq. yds. brick paving, $2.13; earth excavation 35c.; 6,000 lin. ft. curbing, 35c.; total, $23,613; other bidders: Geo. W. Barkwell, $22,477; Johnson & Hyatt, $24,923; O. T. Dunlap, $23,315; Engineer's estimate, $25,719.30.

Kansas City, Mo.—By Park Commissioners, to E. H. Bradbury, to grade 40th st. between Kenwood ave. and Holmes st.

Metuchen, N. J.—Paving Main st., to Liddle & Pfeiffer, Perth Amboy, 68c. per sq. yd.

Newark, N. J.—Paving Concord and Ruynon sts., to Newark Paving Co., $7,788 and $7,634; South and Van Buren sts., to Philip & Peter Jannarone, Belleville, $24,957 and $3,816.

New Brunswick, N. J.—Resurfacing Livingston ave. with Bermuda asphalt, to Thos. F. Dunigan, Woodbridge, $1.04 per sq. yd.

South Orange, N. J.—By Township Committee for oiling roads, to Walter S. Frenc Co., of Moorestown.

Albany, N. Y.—To Dollard & Herran for relaying 5,000 ft. curb, 15c.; laying 400 lin. ft. new curb, 70c.; 8 new catch basins, $50; one moving catch basin, $50; 10,514 sq. yds. Jamestown brick, $2.21, city's portion; total cost, $24,715.94; 3,277 sq. yds., Albany & Southern Railroad's portion, $2.32.

Brooklyn, N. Y.—Regulating and repaving with grade No. 1 granite on a concrete foundation Bay Ridge ave. from Shore roa to 3d ave., to John J. Durkin, 1 Madison ave., New York City, as follows: 11,400 sq. yds. grade 1 granite pavement with cement joints, 1 year maintenance, $2.73; 1,900 cu. yds. concrete for pavement foundation, $4.40; 2,230 lin. ft. new curbs set in concrete, 90c.; 3,350 lin. ft. old curbs reset in concrete, 40c.; total, $42,829; totals of other bids: M. J. O'Hara, 557 3d st., Brooklyn, $43,083; Henry J. Mullen, 289 Fulton st., Jamaica, L. I., $43,883; Richard L. Russell, 186 Remsen st., Brooklyn, $46,337; MacFarlane Construction Co., 165 9th ave., Brooklyn, $44,241; John J. Guinan, Gravesend ave. and Neck road, Brooklyn, $44,442; John F. O'Brien, 740 4th ave., Brooklyn, $44,788; M. F. Hickey, 6th st. and 2d ave., Brooklyn, $43,563; Newman & Carey Co., 215 Montague st., Brooklyn, $44,040; Norton & Gorman Construction Co., 301 Douglas st., Brooklyn, $46,258; regulating and repaving with asphalt on a concrete foundation (a) of Essex and Linwood sts., (b) Greene ave., to Barber Asphalt Paving Co., (b) $33,136; to Uvalde Contracting Co., (a) $17,949; Borough Asphalt Co. bid on (a) $17,988; regulating and repaving with wood block on concrete foundation Clinton ave. from Park ave. to Willoughby ave., to the U. S. Wood Preserving Co., 29 Broadway, New York City, as follows: 7,445 sq. yds. wood block pavement, 5 years' maintenance, $2.38; 7,445 sq. yds. present asphalt pavement and foundation to be removed, 32c.; 30 sq. yds. old stone pavement to be relaid, 40c.; 1,140 cu. yds. concrete for pavement foundation, $5.25; 1,605 lin. ft. new curbs set in concrete, $1; 1,255 lin. ft. old curbs reset in concrete, 40c.; 12 noiseless covers and heads for sewer manholes, $12; total, $28,349; totals of other bidders: Barber Asphalt Paving Co., New York City, $28.99; Republic Construction Co., 18 Broadway, New York City, $28.552.

Buffalo, N. Y.—To Constantine Construction Co., for paving Milton st., 28 ft. wide, with round edge shale brick on concrete base, between Seneca st. and the Pennsylvania Railroad, and to German Rock Asphalt and Concrete Co., Ltd., for paving Sanford st., 26 ft. wide, with standard asphalt, between Dewey and Leroy aves.

Depew, N. Y.—Paving Broadway, 2.3 miles in length, with brick, to Edward T. Beck & Co., Warren, Pa., $53,750.

Lancaster, N. Y.—To Niagara Contracting Co., Corning, for paving with brick principal streets, $68,800.

New York, N. Y.—Paving with asphalt decks of certain piers of East and Harlem Rivers: Class 1, to Barber Asphalt Paving Co., 30 Church st., $1.19 per sq. yd.; class 2, to Sicilian Asphalt Paving Co., 41 Park Row, $1.19 per sq. yd.; class 3, 4, 5 and 6, to Uvalde Asphalt Paving Co., 1 Broadway, $1.18, 90c., 90c. and 84c., respectively.

Rochester, N. Y.—Laying Medina block stone pavements on Clinton ave. South, Griffith to South Goodman st., to Hageman, Miller & Hageman, $73,103; from South Goodman st. to city line, to H. N. Cowles, $43,446.

Seneca Falls, N. Y.—To Patrick D. Conley, Ithaca, for paving State st. and East and West Bayard sts., by Village Board; $17,000 for macadam paving in West Bayard st., $27,800 for brick in East Bayard st., and about $9,300 in State st. for brick.

Utica, N. Y.—Repaving with creosoted wood blocks the viaduct over Ballau Creek at Rutger st., to Harry W. Roberts & Co., $5,825, the same to be completed by July 1.

Yonkers, N. Y.—Repairing asphalt streets for one year, to Hearns & Hart.

Fargo, N. D.—To Ira Eddy for laying cement sidewalks for season, $1.25 per yd.; refilling, 80c per yd.; to Robert Johnson for laying tile sidewalks, $1.09 per yd.

Cincinnati, O.—Furnishing crushed stone and screening for the use of the street and sewer repair department ,to the Tarco Construction Co., $24,127.50 for crushed stone and $5,859.50 for screenings.

Cincinnati, O.—Brick paving on eight alleys, to Evan Evans, $5,965.50.

Chardon, O.—Grading and paving, to Cement Product Co., Erie, Pa., $20,385; other bidders: Linninger & Bennet, $28,837; C. J. Chinnock, $21,877; Gould & Maybach, $21,052; Advance Construction Co., $20,816.

Marion, O.—Constructing Wildcat pike, 6½ miles long, in Big Island and Montgomery Townships, to J. M. Stone, Marion, $25,900; other bidders: E. C. Brady, $27,200; Uncapher & Shaw, $27,186; P. Drake & Sons, $29,910; Carrol & Hoyle, $26,975.

Youngstown, O.—Paving Market st., between viaduct and Warren ave., to Jas. McCarron, $27,609; grading main entrance to Lincoln Park, to Kennedy Bros., $4,900.

Portland, Ore.—Paving East Morrison st. with wood block, to Carbolineum Wood Preserving Co., $18,655; Commercial st., to Consolidated Contract Co., J. N. Johnson, President, $26,610.

Salem, Ore.—Paving with bitulithic Liberty st., to Warren Construction Co., Oregonian Bldg., $1.85 per sq. yd.

Ashland, Pa.—Grading and paving with vit. brick Centre st., approximately 7,000 sq. yds., to Coryell Construction Co., of Williamsport.

Bradford, Pa.—Paving Webster st., 2,623 sq. yds., with brick, to M. Applegate & Son, $2.06 per sq. yd.; 787 cu. yds. excavation, 55c.; cement sidewalks, to J. Sheehan.

Erie, Pa.—Building concrete top for Mill st. culvert, to O. S. Riblet, $925 for work complete.

Scranton, Pa.—Furnishing stone crusher and bin, to Good Roads Machinery Co., $1.159.

Pascoag, R. I.—Paving Main st. with granite blocks, to Fred L. Mathewson, Harrisville, $2.25 sq. yd.

Austin, Tex.—Paving, as follows: To Dallas Bitulithic Co., for 37,778 sq. yds. bitulithic at $2.278 per sq. yd., total $86,058, and to Knox Johnson for 7,933 sq. yds. wood blocks, $2.325 per sq. yd., or total of $18,144.

Portsmouth, Va.—Street work in Sixth Ward: Grading Glasgow st., Scott's Creek to city limits, to E. P. Lindsay, $2,431; curbing same thoroughfare, to F. J. McGuire, $2,987; paving Glasgow st. with 4½-in. concrete base, 2½-in. macadam top with tarvia binder, to F. J. McGuire, $6,760.20; total cost of paving will be $12,178.20; grading County st., Chestnut to Rose st., to E. P. Lindsay, $4,207; Pearl st., County to South st., to E. P. Lindsay, $1,039; placing granite curb in County st., Chestnut st. to Rose st., F. J. McGuire, $5,800; paving County st., Chestnut to Rose, 4-in. concrete base with 2½-in. macadam top, with tarvia binder, to F. J. McGuire, $22,104.60; the Air Line turnpike from Rose st. to the city limits, with macadam, to F. J. McGuire, $2,679; bring the rails of the Traction Company on County st. up to grade, to F. J. McGuire, $2,500.

Milwaukee, Wis.—Furnishing 16,500 cu. yds. of crushed stone, to Wisconsin Stone Co., $1.23 for west side and 9,000 cu. yds. for south side, $1.25.

Green River, Wyo.—By city, to Geo. Durnford, of Evanston, for construction of 18 blocks of cement sidewalk and 20 street crossings.

BIDS RECEIVED

Indianapolis, Ind.—Paving Locke st., Walnut st. to Indiana ave., American Construction Co., brick, $2.33 per lin. ft. on each side and street and alley intersections, $1,150; Marion County Construction Co., asphalt or bitu mineral, $3.30 per lin. ft. for each side and street and alley intersections, $1,120.

Saginaw, Mich.—Paving with asphalt, W. N. Sager, $1.49½; Quinlan Asphalt Co., Syracuse, N. Y., $1.64; Cleveland Trinidad Co., $1.58, and Carpenter & Anderson, Grand Rapids, $1.50; brick, Z. & J. La Londe, Saginaw, and E. W. Reed, Detroit, $1.42 each, and A. Gelinas & Sons, $1.44; Saginaw material was named in all brick proposals; fifteen streets are to be paved.

Atlantic City, N. J.—Paving Vermont and other avenues, W. R. Keith, brick gutter, $2.52; bituminous, $2.66; bituminous old fill, $2; gutter, $2; rock, ton, $2.50; curb, 70c.; United Paving Co., brick gutter, $2.57; bituminous, $2.62; bituminous old fill, $1.95; gutter, $2; rock, ton, $2.56; curb, 68c.; Standard, New York, brick gutter, $2.62; bituminous, $2.68; bituminous old fill, $2.02; gutter, $2.05; rock, ton, $2.45; curb, 74c.; paving Congress ave., Calloway pl. and Euclid ave., United Paving Co., gutter, $2.57; bituminous, $2.62; curb, 68c.; W. R. Keith, Rockford, Mass., gutter, $2.52; bituminous, $2.66; curb, 70c.; Standard, gutter, $2.62; bituminous, $2.68; curb, 74c.

Fulton, Mo.—Paving with macadam with binder, Jos. Pope, Jefferson City, lowest bidder, West 7th st., excavation, 30c.; curbing, 33c.; macadam, 63c. and parking, 5c.; East 5th st., 30c., 33c., 82c. and 3c.; totals, $4,587.25 and $8,287.87; Engineer's estimate, $4,837.81 and $9,484.85; other bidders: Johnson & Hyatt, $4,710.20 and $8,734.11; Geo. W. Barkwell, $4,621.87 and $9,009.23; O. T. Dunlap, $5,963.88 and $10,567.96.

Newark, N. J.—Resurfacing number of roads with stone, supplying of broken stone for others and the use of amesite for resurfacing; Springfield ave., Stuyvesant ave. to Rahway River, 10,000 ft., Millburn Trap Rock Co., 48c. per sq. yd.; Northfield road, on easterly slope of First Mountain, 2,000 ft., Daniel J. O'Rourke, 35c.; Mt. Pleasant ave., Prospect ave. to Rahway River, 2,500 ft., Donato Fusco, 37c.; Little Falls road, Montclair, 2,000 ft., Robert Doriety, 34½c.; Mt. Hebron road, Montclair, 2,000 ft., Robert Doriety, 38½c.; Grove st., Montclair, 8,000 ft., Osborn & Marcellus, 32c.; Sanford ave., Irvington, 6,000 ft., R. H. Kernan and Ludwig Bott, tied, 35c.; Stuyvesant ave., Irvington, 10,000 ft., R. H. Kernan, 38c.; Grove st., East Orange, 2,500 ft., Eagle Rock ave., different sections, 5,500 ft., P. A. Matthews, 30c.; Ridge road, south end, 3,000 ft., P. A. Matthews, 30c.; Pompton turnpike, Bloomfield ave. N., 3,000 ft., F. H. Marley, 24c.; South Orange ave., Centre st. W., 2,000 ft., R. H. Kernan, 29½c.

Geneva, O.—Paving Main St. (A) E. A. Freshwater & Sons, awarded contract, for Century block, $46,437; (B) Ohio Engineering Co.; (C) The Buckeye Engineering Co.; (D) The Enterprise Paving & Construction Co.; (E) H. N. O'Berlander; (F) Wilson & Harper; (G) Geo. M. Harris; (H) Downs & Campbell; (J) J. J. & K. W. Burns; (K) Gould & Mayback; (L) Baldwin Bros.; (M) Wm. E. McHugh; (N) Hewit Construction Co.

	A	B	C	D	G	H	J	K	L	M	N
8,111 cu. yds. grading	$ 0.30	$ 0.30	$ 0.40	$ 0.30	$ 0.48	$ 0.40	$ 0.35	$ 0.30	$ 0.30	$ 0.28	$ 0.35
18,817 sq. yds. foundation	.55	.57	.66	.63	.65	.55	.70	.60	.57	.65	.56
18,817 sq. yds. Collinwood block	1.01	1.00	.94	1.18	1.16	1.09	1.04	1 .13	1.07	.95	1.00
18,817 sq. yds. Buckeye block	....	....	....	....	....	....	....	..	1.11	....	1.00
18,817 sq. yds. Newburg block	1.02	1.04	....	1.19	1.17	1.10	1.05	1.14	1.10	.96	....
18,817 sq. yds. Cleveland block	....	1.04	....	1.20	1.18	....	1.06	....	....	....	....
18,817 sq. yds. Century block	1.03	1.04	.96	1.20	1.18	1.11	1.06	1.15	1.11	.97	....
18,817 sq. yds. Bessemer block	1.03	1.04	.96	1.20	1.18	1.09	1.06	1.15	1.11	.97	1.00
18,817 sq. yds. Metropolitan block	....	1.09	1.01	1.25	1.23	1.16	1.11	....	1.16	1.02	....
18,817 sq. yds. Big Four block	....	1.09	1.01	1.26	1.23	1.16	1.11	....	....	1.02	....
18,817 sq. yds. Medal block	....	1.09	1.03	1.27	1.25	1.18	....	....	1.16	1.04	....
11,875 lin. ft. straight curb	.55	.60	.64	.64	.70	.75	.60	.71	.55	.54	.54
594 lin. ft. curved curb	1.00	.80	.94	.80	.93	1.25	.75	1.15	.70	.90	.65
50 lin. ft. curb reset	.20	.50	.39	.40	.60	.40	.35	.45	.10	.25	.10
293 lin. ft. headers	.50	.40	.40	.30	1.00	.40	.70	.50	.60	.80	.50
568 sq. ft. new sidewalk	.12	.12	.12	.15	.15	.16	.16	.12½	.11	.12	.12
836 sq. ft. sidewalk relaid	.03	.05	.04	.05	.08	.04	.06	.05	.03	.08	.03
19 manhole caps reset	2.00	1.50	1.25	2.00	1.50	3.00	1.50	1.00	.50	3.00	2.00
1 new manhole cap	5.00	15.00	8.25	12.00	12.00	10.00	15.00	5.00	9.00	17.00	12.00
4 lamphole caps reset	3.00	1.50	3.00	2.00	1.50	2.00	1.00	.50	.50	2.00	2.50
3 trees removed	5.00	5.00	1.00	3.00	15.00	5.00	10.00	2.00	5.00	6.00	15.00
2,700 lin. ft. underdrain	.18	.12	.08	.08	.10	.20	.14	.20	.12	.08	.13
1,170 lin. ft. house sewer	.02	.30	.31	.45	.45	.30	.30	.85	.60	.35	.35
644 lin. ft. inlet basin pipe	.55	.50	.48	.50	.65	.40	.57	.40	.30	.50	.45
36 inlet basin pipes	15.00	15.00	17.50	20.00	25.00	20.00	20.00	18.00	12.00	25.00	23.00
23 manholes	25.00	25.00	30.00	35.00	30.00	25.00	31.00	25.00	20.00	25.00	31.00
10.7 lin. ft. of manhole	5.00	3.50	2.50	7.00	5.00	3.00	3.50	3.25	2.50	3.00	4.50
1,700 lin. ft. 18-in. pipe 6 ft. deep	1.10	.70	.70	.80	1.00	.70	.75	.85	.73	.97	.80
425 lin. ft. 18-in. pipe 6 to 8 ft. deep	1.35	.80	.78	.90	1.10	.80	1.00	.85	.96	1.07	.90
241 lin. ft. 18-in. pipe over 8 ft. deep	1.50	.90	1.00	1.25	1.25	1.00	1.10	.95	1.08	1.35	1.00
730 lin. ft. 15-in. pipe 6 ft. deep	.80	.55	.60	.70	.80	.65	.65	.70	.59	.60	.65
275 lin. ft. 15-in. pipe 6 to 8 ft. deep	1.00	.65	.65	.80	.95	.65	1.05	.75	.82	.80	.75
1 lin. ft. 15-in. pipe over 8 ft. deep	1.50	.80	.80	1.15	1.10	1.00	1.20	.75	1.14	1.20	2.00
1,297 lin. ft. 12-in. pipe 6 ft. deep	.60	.45	.45	.60	.70	.50	.52	.60	.50	.52	.49
350 lin. ft. 12-in. pipe 6 to 8 ft. deep	.75	.50	.50	.70	.80	.50	.59	.60	.73	.65	.57
40 lin. ft. 12-in. pipe over 8 ft. deep	1.00	.75	.65	1.00	1.00	.60	.97	.65	.85	.80	.67
1 branch on 18-in. pipe	5.00	2.30	2.15	3.00	1.75	3.00	1.50	1.50	3.30	7.00	3.50
1 branch on 15-in. pipe	4.50	2.10	1.50	2.50	1.50	3.00	1.21	1.00	2.70	6.00	3.00
1 branch on 12-in. pipe	4.00	1.50	1.20	2.25	1.00	3.00	.90	.80	2.00	5.00	2.50
1 cu. yd. rock excavation	6.00	4.00	2.50	5.00	4.00	5.00	5.00	1.50	4.00	3.00	.01
1,000 ft. B. M. sheeting	30.00	30.00	35.00	30.00	30.00	30.00	40.00	30.00	20.00	40.00	18.00

Paving Broadway, to same, for century block, $34,823; bids for material were practically same as above.—Cummings & Downer, Painesville, Engineers.

Philadelphia, Pa.—Asphalt repairs to traction streets, Filbert Paving and Construction Co. bid 63c. per sq. yd. and the Barber Asphalt Co. 54c.; granite block along rails and between rails, Filbert Co. 15c., and the Barber, 20c. per yd.

Vancouver, B. C., Can.—Grading 12th ave., Granville to Hemlock, A. R. Gibson, $6,975; M. P. Cotton, $8,287.50; H. V. Tucker, $6,630; R. J. Preston, $8,287.50; Cleland & McLeod, $8,840; LaPlace Bros., $6,398; tenders for grading, grade 13th ave., Spruce to Birch, Cleland & McLeod, $5,-149.90; A. R. Gibson, $5,500; D. Matheson, $5,149.90; LaPlace Bros., $5,989.20; 11th ave., Spruce to Alder, Cleland & McLeod, $4,100; A. R. Gibson, $3,950; LaPlace Bros., $4,359; 12th ave., Spruce to Alder, Cleland & McLeod, $4,131; D. Matheson, $4,712; A. R. Gibson, $4,050; LaPlace Bros., $4,608; 12th ave., Main to Sophia, Cleland & McLeod, $2,600; LaPlace Bros., $2,841; bitulithic paving on 12th ave., two sections, Columbia Bitulithic Co., from Bridge to Columbia, $14,300; from Columbia to Main, $20,891.34.

SEWERAGE

Oxford, Ala.—Election on $12,000 bonds for sewerage improvements has been postponed until May 29.

Pollard, Ala.—City has decided to construct sewer system.

Orland, Cal.—Citizens have voted $25,000 bonds for sewer system.

St. Petersburg, Fla.—Citizens will vote June 13 on $5,000 bonds for sewers.

Collegepark, Ga.—City has engaged Doak & McKechnie, of Greenville, S. C., as Engineers in charge of installation of sewerage and water works.

Unadilla, Ga.—City is considering installation of sewers; Engineer C. F. Wagner, representing J. B. McCrary Co., Atlanta, will run town line of streets and prepare map.

Brazil, Ind.—Plans have been prepared for sewer work including 20,000 ft. of concrete sewer and 3,000 ft. of sewer pipe.—Frank Kattman, City Engineer.

Fairfield, Ia.—Hall & Adams, Centerville, have been selected as engineers to prepare plans for installation of complete sanitary sewer.

Reed City, Mich.—Council has passed resolution directing the President to engage engineer to prepare plans for sewer system and rehabilitation of water works.

Proctor, Minn.—Bond issue for construction of sewers is being considered.

Billings, Mont.—Council is considering resolution for forming of sewer district in North Elevation subdivision; system will include 9,000 lin. ft., 8- and 10-in. pipe, 26 manholes, seven flush tanks and 6,556 cu. yds. of excavation; total cost, $12,497.

Ocean City, N. J.—Citizens have defeated $75,000 bond issue for storm water drainage.

Seaside Park, N. J.—Borough Council is considering $35,000 expenditure on sewer, water and light plant.

Roswell, N. M.—Council has authorized building of $3,400 ft. of sewer to extend system into Lea subdivision.

Carey, O.—Riggs & Sherman, of Toledo, have been selected to prepare plans and specifications for sewer and sewage disposal plant.

Girard, O.—Council has adopted set of storm sewer plans as prepared by City Engineer Wm. Wilson; cost $8,000.

Hilliard, O.—Citizens voted $8,000 bonds for sewer system.

Bristol, Pa.—Changes will be made in proposed sewage disposal plant on suggestions by Dr. Dixon; sterilization plant will be installed instead of sand filters as originally proposed, while Imhoff digesters will be installed instead of septic tanks, and sprinkling filters instead of concrete beds; site of plant will be changed to higher ground, and to a point 500 ft. nearer Pennsylvania Railroad tracks.

Sharon, Pa.—Trimble & Miller, of Pittsburg, are preparing plans for sewage disposal plant.

Zelienople, Pa.—Town is planning additional sewerage.

Pawtucket, R. I.—Joint resolution has been passed by Board of Aldermen appropriating $1,350 for sewer in Rhode Island ave.

Woonsocket, R. I.—Board of Aldermen has passed ordinance for construction of sewers in Harrison ave. and Glen road.

Bastrop, Tex.—Sewerage system will be at once installed in Main st.; later will be extended over all parts of city.

Itasca, Tex.—Citizens have voted to install sewerage system.

Slaton, Tex.—City is considering installation of sewerage system.—J. S. Edwards, Mayor.

Ronceverte, W. Va.—Citizens will vote on $5,000 bonds for extension of sewer and water systems.

Milwaukee, Wis.—Special Sewerage Commission, J. W. Alvord, Chairman, has recommended entire rearrangement of city's sewerage system by erecting miles of main intercepting sewers along river front at cost of $2,213,000; purification plants on shore of Kinnickinnic River, $933,000, and on lake shore, $2,668,000; flushing tunnel for Menominee River, $1,162,000; sewage pumping plant, $669,000; low level intercepters, $4,110,000, and installation of complete filtration plant, $1,500,000.

Green River, Wyo.—Surveys and estimates have been made for 2,500 ft. of 8-in. sewer with 8 manholes, which will be an extension to present city sewer system. Turpin & Eldridge, Civil Engineers, of Rawlins, are Engineers for this work.

Camrose, Alta., Can.—Ratepayers have voted $83,000 for construction of sewerage and water works systems.

CONTRACTS AWARDED

Bement, Ill.—To Arthur Birt, Decatur, by the Board of Local Improvements, for the furnishing of material and construction of system of storm sewers and also an outflow drain.

Galva, Ill.—Building sewer, to R. C. Richter, of Manitowoc, Wis., $15,702.

Gibson City, Ill.—To Frank Sullivan, Bloomington, by Town Board, for sewer work, $2,500.

Peoria, Ill.—To Ottawa Construction Co., Ottawa, for construction of the Swinnerton st. sewer.

Kokomo, Ind.—Building intercepting sewer, to Michaels-Minnick Co., Marion, $47,-041.45; only other bidder, Reliable Construction Co., Indianapolis, $47,700.

Kokomo, Ind.—Construction of sewers, to Michael & Murnick, Marion, $47,041.11; other bidder, Reliable Construction Co., Indianapolis, $47,700.

Cloquet, Minn.—Extending sewer and water system, to Pastoret-Lawrence Co., Duluth, $23,398.43.

Duluth, Minn.—Laying storm sewer in 6th ave. West, to P. McDonnell, $12,761.10.

Deming, N. M.—Constructing a sanitary sewer system, to G. Jaeger, of Rich Hill, Mo., $34,940; contract calls for 38,600 ft. sewer, 80 standard manholes, 5 flush tanks, one double compartment septic tank, etc.—W. B. Bullock, Kansas City, Mo., Engineer.

Utica, N. Y.—Construction of a sewer in Warren ave., Holland ave. to Genesee st., to Jeremiah Augar, $2,065.50.

Fargo, N. D.—To Gilbert W. Haggert for building sewers on 9th st., $1.24 per lin. ft.; $50 for manholes and $50 for catch basins; on 10th st., to same, $1 per ft., $50 for manholes and $50 for catch basins.

Hubbard, O.—Construction of a sewer system and disposal plant, to Harry Baxter, Lorain, $23,269.65.

Doylestown, Pa.—Reconstructing sewage disposal beds, to Julian M. Solomon, Jr., 30 N. 7th st., Philadelphia.—Wm. Bishop, Superintendent.

Erie, Pa.—Building 9-in. sewer in East 14th st., to F. J. Eichenlub, $4.50 per ft. for pipe and $150 for manholes.

Kenosha, Wis.—To White Construction Co. for building main sewer of concrete, $97,200.

BIDS RECEIVED

Washington, D. C.—Bids were received as follows on May 1 by District Commissioners for construction of sewers in Cleveland Park: George Hyman, excavation, $2.40; sewer brick masonry, $14; 10-in. sewer, 55c.; Warren F. Brenizer Co., excavation, $1.40; sewer brick masonry, $14; 10-in. sewer, 70c.

Butler, Pa.—Sewer on Miller st., W. J. Eury, 6-in. sewer, 38c.; 8-in. sewer, 43c.; N. J. Boyer, 8-in., 40c.; 6-in., 35c.; 4-in., 33c.; flush tanks, $65; "Y" branches, 30c.; F. E. McQuistion, 6-in., 44c.; 8-in., 47c.; manholes, $25; flush tanks, $60; laterals, 35c.; "Y" branches, 35c.; Tony Morelli, 4-in., 34c.; 8-in., 44c.; flush tanks, $65.25; "Y" branches, 65c.; manholes, $35.50; section of sewer on 4th st., J. E. Huselton, 8-in., 55c., 4-in., 45c., "Y" branches, 35c. extra: W. J. Eury, 45c.; "Y" branches, 44c.; laterals, 35c.; N. J. Boyer, 8-in., 60c.; 6-in., 35c.; "Y" branches, 35c.; H. A. McNamee, 8-in., 75c.; 4-in., 60c.; "Y" branches, 50c.; Tony Morelli, 8-in., 48c.; 4-in., 35c.; "Y" branches, 75c.

WATER SUPPLY

Booneville, Ala.—Booneville Oil and Gas Co. is considering construction of water works and gas plant; has applied for franchise.

Pollard, Ala.—City will construct water works and sewer system, including pipe 6 ins. in diameter to depth of 800 to 1,000 ft., where it is expected to secure flow of water which will rise to height of 60 ft. from ground; water will flow into tank of about 35,000 gals. capacity.

Doris, Cal.—City has sold $12,500 water bonds to G. G. Blymer & Co., San Francisco.

Orland, Cal.—Citizens have voted $25,000 bonds for water works system.

Milton, Del.—Council has commissioned George E. A. Fairley, Baltimore, to make plans for water system of artesian wells and standpipe.

Washington, D. C.—American Consul in an European country reports that Mayor of a city in his district has applied for information regarding pumps run by electricity; the Mayor desires to install in the city wells pumps of this character, and wishes to be put in touch with manufacturers. Address No. 6686, Bureau of Manufactures.

St. Petersburg, Fla.—Citizens will vote June 13 on $5,000 bonds for extension of water works.

Collegepark, Ga.—City has engaged Doak & McKechnie, Greenville, S. C., as Engineers in charge of installation of water works and sewerage.

Tallapoosa, Ga.—Citizens will vote on $25,000 water works bonds to purchase water works system now in operation, and improving same by installing filtering system and adding other improvements.

Ilo, Ida.—Council is considering installation of water works.

Hammond, Ind.—W. F. Brunt, 25 Marion st., will purchase power-driven diaphram pump.

Richmond, Ind.—Board of Works has advertised for bids for supplying water to citizens of Richmond from five to twenty-five years.

South Bend, Ind.—Complete rehabilitation of the city water works system at expense of approximately $335,500 has been recommended by Clinton S. Burns, of Burns & McDonnell, Hydraulic Engineers, Kansas City, Mo.; work includes pumping station in the northwest section of city, the cost of which will be $25,000; auxiliary station in Leeper Park, costing $7,200; water tower in the south end, $18,700; new lines and extensions, $110,000; 5,000,000-gal. reservoir, $43,500; new wells, $20,000, and 8,000,000-gal. capacity engine, $30,000.

Blockton, Ia.—Citizens will vote on installation of $15,000 water system.

Fairfield, Ia.—Hall & Adams, Centerville, have been selected as engineers to prepare plans for improvements to water works plant, including filtration plant.

Shelbyville, Ky.—Charles E. Collins, Consulting Engineer, Drexel Bldg., Philadelphia, is preparing plans for concrete dam for Shelbyville Water and Light Co.

Kentwood, La.—Town is being surveyed for location of water works and electric light system.

North Haven, Me.—City proposes to construct water works.—J. O. Brown, Town Clerk.

Lynn, Mass.—Council has authorized $75,000 bond issue to cover cost of installing pump at Montrose, pump at the easterly end of Glen Lewis Pond, laying of pipe line from the proposed Glen Lewis pumping station to Breed's Pond, and preparation of plans for raising of Breed's Pond Dam to a height of 51 ft.

Worthington, Mass.—Water Commissioners of Worthington Fire District have engaged E. E. Davis, Northampton, civil engineer, to make necessary surveys and estimates for water supply.

Oswosso, Mich.—Superintendent of Public Works has recommended improvements to water works.

Eveleth, Minn.—Installation of new and enlarged water main is being considered.

Ossipee, N. H.—Dudley & Sawyer, Manchester, are preparing plans for water works for the Ossipee Water Co. to supply village of Moultonville, Mountainview and Center Ossipee with water by gravity from Dam Hole Pond.—Col. L. A. Merow, President.

Seaside Park, N. J.—Borough Council is considering $35,000 expenditure on water, sewer and light plant.

Bloomingdale, N. Y.—Village has sold $15,000 water bonds and will at once install system.

Fredonia, N. Y.—Board of Trusteees has decided to engage Frederick K. Wing, of Buffalo, to look over situation in regard to proposed improvements at the water works and pass on feasibility of plans that already have been drawn; plans call for expenditure of $16,000.

Granville, N. Y.—Charles E. Collins, Consulting Engineer, Drexel Bldg., Philadelphia, Pa., is preparing plans for improvements to water works, including concrete reservoir, filtration plant, a pumping station of about 2,000 gals. per minute capacity and about two miles of 12-in. c.-i. mains.

Lyons, N. Y.—Citizens have defeated $4,000 appropriation for pure water supply.

Newport, N. Y.—Morrell Vrooman, of Gloversville, is preparing plans for proposed water distribution system.

New York, N. Y.—Board of Estimate has approved plan of Commissioner Thompson for completion of easterly basin of Jerome Park reservoir, and construction of sand filtration plant for purification of the water from Croton watershed; $8,690,000 corporate stock will be issued to carry out the proposed improvements.

Morgantown, N. C.—Citizens have voted $35,000 bond issue for water works.

Zanesville, O.—Johnson & Fuller, 150 Nassau st., New York, N. Y., have been selected as engineers to design system of water works.

Hermiston, Ore.—John T. Whistler has been engaged by Council to make a survey of city and report on the most feasible plan for water system.

Franklin, Pa.—City will expend about $23,000 for improvements to include pump, boiler, etc.—Phil. Heid, Superintendent Water Works.

Juniata, Pa.—H. C. Linton, Altoona, is preparing plans for water works; cost $25,000.—W. H. Baird, Borough Clerk.

Montrose, Pa.—Council is considering resolution that committee be appointed to in-

Easton, Md.—Building sewer and sewage disposal plant, bids received Apr. 15: (A) Heins & Hayman, successful bidders, $37,011.78; (B) United Paving Co., Atlantic City, $39,117.06; (C) Coryell Construction Co., Williamsport, Pa., $40,239.15; (D) B. F. Sweeten & Son, Camden, N. J., $40,262.76; (E) D. M. Andrew & Co., $40,733.04; (F) Hard & Worm, New York, $41,285.77; (G) J. B. O'Rourke & Co., Boston, Mass., $42,877.01; (H) Martin & Miller, Roselle Park, N. J., $44,311.35; (J) W. F. & C. F. Thompson, Baltimore, $45,312.76; (K) Kingdon Construction Co., Baltimore, $46,353.05; (L) Wm. C. Evans, Ambler, Pa., $51,867.17; Clyde Potts, 30 Church St., New York City, Engineer.

Item.	Quan.	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.	L.
8" pipe 0-6 cut	1,787	.39	.43	.45	.45	.52	.44½	.53	.45	.53	.45	.56
8" " 6-8 "	9,715	.48	.46	.58	.52	.64	.48	.55	.53	.59	.54	.74
8" " 8-10 "	9,620	.59	.60	.70	.68	.75	.54	.70	.69	.80	.75	.95
8" " 10-12 "	1,075	.75	.76	.82	.88	.87	.70	.84	.95	.99	.95	1.29
8" " 12-14 "	..	1.18	1.06	.95	1.13	1.10	.85	1.30	1.45	1.21	1.04	1.70
8" " 14-18 "	..	1.90	1.73	1.20	1.96	1.60	1.46	2.75	3.00	1.70	1.15	2.85
10" " 0-6 "	..	.54	.51	.54	.53	.68	.56	.59	.65	.70	.59	.66
10" " 6-8 "	820	.59	.55	.66	.60	.86	.59	.65	.77	.79	.74	.82
10" " 8-10 "	1,790	.69	.68	.80	.76	1.00	.65	.90	.80	1.05	.85	1.14
10" " 10-12 "	1,425	.81	.85	.91	.96	1.16	.80	.97	.87	1.30	1.00	1.37
10" " 12-14 "	365	1.22	1.15	1.05	1.25	1.37	.95	1.47	1.50	1.57	1.13	1.71
10" " 14-18 "	..	2.00	1.83	1.35	2.00	1.80	2.05	3.00	3.00	2.19	1.24	2.90
12" " 0-6 "	2,215	.58	.65	.60	.65	.69	.59	.69	.75	.74	.69	.78
12" " 6-8 "	525	.70	.71	.75	.72	.96	.63	.79	.83	.92	.81	.97
12" " 8-10 "	40	.84	.81	.90	.88	1.09	.65	1.00	.97	1.19	.95	1.25
12" " 10-12 "	635	1.05	.97	1.03	1.08	1.23	.90	1.15	1.25	1.44	1.12	1.49
12" " 12-14 "	430	1.35	1.33	1.17	1.37	1.41	1.01	1.55	1.90	1.76	1.32	1.90
12" " 14-18 "	110	2.10	1.95	1.49	2.37	1.90	2.20	3.50	3.00	2.44	1.50	2.95
12" " 18 up	..	2.30	2.79	2.00	3.00	2.50	4.10	5.00	5.00	3.07	1.86	3.50
15" " 0-6 "	720	.68	.76	.74	1.35	.87	.78	.85	1.00	.97	.85	1.02
15" " 6-8 "	200	.88	.89	.93	1.50	1.04	.80	1.00	1.15	1.15	.96	1.21
15" " 8-10 "	..	1.12	1.56	1.10	1.75	1.40	.82	1.15	1.25	1.48	1.14	1.55
15" " 10-12 "	..	1.48	1.67	1.24	2.00	1.75	1.13	1.50	1.50	1.78	1.31	1.85
15" " 12-14 "	..	1.97	2.03	1.40	2.25	2.10	1.24	1.75	1.85	2.11	1.59	2.40
Manholes 10' and under	118	38.00	49.83	52.00	35.00	35.00	61.50	42.00	39.00	40.00	55.00	58.00
Extra depth M. H. per ft	20	3.80	4.98	3.40	4.00	4.00	4.00	5.00	4.50	4.00	3.80	4.50
Flap valves for F. T.	32	12.00	13.35	17.50	7.50	12.00	11.50	12.00	15.00	15.00	15.00	7.00
Water con. to F. T.	32	8.50	6.43	10.00	15.00	15.00	21.50	10.00	10.00	10.00	7.20	10.00
Lamp holes	20	8.50	7.59	9.00	10.00	8.00	6.50	10.00	10.00	7.00	6.75	12.00
Deep house con.	200	.30	.23	.12	.50	.60	1.25	.30	1.00	1.00	.25	.12
Lumber foundations, bd. ft.	10,000	39.00	34.50	40.00	35.00	35.00	45.00	35.00	35.00	40.00	45.00	45.00
Lumber sheeting, bd. ft.	10,000	25.00	40.25	25.00	35.00	15.00	50.00	30.00	30.00	25.00	32.00	35.00
Cast iron pipe	3 T.	40.00	40.25	35.00	50.00	35.00	37.50	45.00	50.00	50.00	37.50	33.00
Extra concrete, yds.	10	7.00	7.36	8.00	10.00	9.00	11.50	8.00	8.00	9.00	8.00	7.00
Fill, yds.	200	.40	.69	.50	.75	.25	.85	.60	.50	1.00	.25	.60
N. settling and sterlizing tank minus engine and pump	..	4,600.00	4,538.53	3,750.00	3,725.00	3,200.00	4,950.00	4,950.00	5,700.00	5,400.00	5,900.00	4,800.00
S. settling and sterilizing tank minus engine and pump	..	4,200.00	4,232.62	3,500.00	3,625.00	3,200.00	4,435.00	4,800.00	5,000.00	4,500.00	5,540.00	4,500.00
North sludge bed	..	700.00	756.15	900.00	1,600.00	1,266.00	1,370.00	1,000.00	1,350.00	800.00	1,400.00	1,385.00
South sludge bed	..	700.00	756.15	900.00	1,800.00	1,266.00	1,370.00	1,000.00	1,350.00	800.00	1,400.00	1,385.00
Engine and pump for N. tank	..	750.00	939.75	700.00	770.00	650.00	450.00	800.00	700.00	700.00	500.00	850.00
Engine and pump for S. tank	..	750.00	939.75	700.00	770.00	650.00	450.00	800.00	700.00	700.00	500.00	850.00
5" house connections	..	.38	.40	.35	.65	.60	.96	.45	.35	1.50	.35	.37

OGDEN CITY, UTAH.—CONCRETING CITY RESERVOIR NO. 1; CONTRACT AWARDED TO MORAN CONTRACTING CO.

Description.	Estimated Quantities	MORAN CONTRACTING CO.	MCKAY & REED.	J. P. O'NEILL CONS. CO.	GILLIS CONS. CO.	LYNCH-CANNON ENGR. CO.	WHEELWRIGHT CONS. CO.	WILLIAM DOYLE.
		Price.	Price.	Price.	Price.	Price.	Price.	Price.
Excavation	12,618 cu. yds.	$0.20	$0.30	$0.40	$0.46	$0.36	$0.50	$0.55
Concrete in outlet gate chamber	53 cu. yds.	6.80	9.00	9.00	9.00	12.00	9.00	9.00
In reservoir	1,502 cu. yds.	6.80	6.90	7.00	7.00	7.54	7.00	6.95
Outlet gate house	Complete	150.00	125.00	36.00		110.00	75.00	225.00
Hauling and laying Matthewson Joint Pipe								
12-inch diam	110 lin. ft.	.40	.15	.44	.10	.25	.24	.46
20-inch diam	100 lin. ft.	.60	.30	.54	.10	.30	.40	.70
24-inch diam	120 lin. ft.	.90	.40	.65	.10	.35	.48	.84
Hauling and laying vitrified cement pipe								
6-inch	350 lin. ft.	.20	.06	.08	.10	.12	.1	.17
8-inch	25 lin. ft.	.30	.10	.12	.10	.18	.16	.40
10-inch	25 lin. ft.	.35	.15	.18	.10	.23	.20	.48
12-inch	100 lin. ft.	.40	.20	.34	.10	.29	.24	.50
Constructing and erecting fence	750 lin. ft.	1.33	1.20	1.08	1.00	1.18	1.50	1.43
Removing old material	Complete	....	....	8.00	....	50.00	50.00	150.00
Hauling and setting								
Setting 36x36-inch C.L. gratings	1 only	7.00	2.00	5.50	10.00	5.00	2.00	5.00
Setting 12x18-inch gratings	6 only	1.25	.50	1.00	10.00	2.00	2.00	3.00
Totals		$14,597.85	$15,797.95	$17,276.60	$17,698.28	$17,746.31	$18,763.00	$19,679.20

vestigate ways and means of installing water plant to be operated by borough.

West Chester, Pa.—Council has decided to install larger water mains.

Arlington, Tenn.—City is considering installation of water plant; cost $6,000.

Terrell, Tex.—Commission has ordered purchase of 22,200 ft. of new 8-in. water main to be installed on North Rockwall ave.

Camrose, Alta., Can.—Ratepayers have voted $83,000 for construction of water works and sewerage systems.

London, Ont., Can.—Tenders will soon be asked for three or four deep wells with 8-in. casing, about 12,700 ft. of 4-in., 6-in. and 8-in. c.-i. water pipe, about 35 hydrants and 8 tons of special castings, also 1 steel elevated tank, 125 ft. high, capacity 40,000 or 50,000 gals; pumping equipment not decided upon until wells are driven; two half million gal. pumps or greater, also deep well pumps or air lift will be installed.—F. W. Farncomb, Chief Engineer.

Prince Rupert, B. C., Can.—Plans have been prepared for Council by Col. W. H. M. Davis for a permanent water supply for city; estimated cost of $330,000 for supply main, $480,000 for whole work.

South Vancouver, B. C., Can.—City will soon receive bids for 42 miles of 4-in. and 8 miles of 6-in. steel pipe; furnishing 45,000 ft. of ½-in. and 20,000 ft. of ¾-in. g.-i. pipe; 4,400 brass cocks, 300 fire hydrants and special castings and pig lead.

Tavistock, Ont., Can.—F. W. Farncombe, London, has prepared plans for water works; cost about $22,000.

CONTRACTS AWARDED

Corning, Cal.—Construction of water system, to Braun, Williams & Russell Co., $40,500.

Alamosa, Col.—Constructing water works, to Marshall Bros., Las Animas, $74,000.

Dolores, Col.—To Engineer Geo. H. Sethman, Denver, for constructing water works, about $40,000.

Washington, D. C.—Furnishing 90 tons of c.-i. water pipe and specials, to Standard Cast Iron Pipe and Foundry Co., Bristol, Pa., $51.50 per gross ton, and 2,411 tons c.-i. water pipe, to U. S. Cast Iron Pipe and Foundry Co., 71 Broadway, New York, at $22.84 per gross ton; furnishing corporation and curb cocks, 4,000 ¾-in. corporation cocks, to the Glauber Brass Mfg. Co., Cleveland, O., at 56.5c. each; 200 1½-in. corporation cocks, to A. P. Smith Mfg. Co., of East Orange, N. J., $1.96 each; 250 ¾-in. lead flanged corporation cocks and 4,250 ¾-in. lead flanged curb cocks, for lead and pipe only, to Hays Mfg. Co., of Erie, Pa., 58.5c. and 63c., respectively.

Chicago, Ill.—Furnishing and installing sluice gates in the Southwest Land tunnel, to Coffin Valve Co., Neponsit, Boston, Mass., $7,000.

Orangeville, Ill.—Building water tank, to U. S. Wind and Pump Co., Batavia.

Whiting, Ind.—Construction of 14-in. water mains in 121st st., Indian blvd. and Clark st., to W. H. Brunt, $9,664; other bidders: Neydl & Greenwald, $10,055; T H. Iglehart, $10,525.

Arkansas City, Kan.—To Layne & Fowler Co., Houston, Tex., to furnishing city with water, $13,500, city to furnish pipe, erect settling basin and convey water to pumping station at cost of $14,000; work to begin at once.

Hoisington, Kan.—To Bash & Gray, Joplin, Mo., for constructing water system.—Rollins & Westover, Beals Bldg., Kansas City, Mo., Engineers.

White Castle, La.—Laying 2,000 ft. of water mains on lower Bowie st., to David Lopez; material will be furnished by Woodward, Wight & Co., Ltd., New Orleans.

Fort McKinley, Me.—Installation of chemical water softening plant, to the L. M. Booth Co., 116 Liberty st., New York, for plant complete, except item 4, at $6,320; to F. H. Marshall, item 4,

Longmeadow, Mass.—By Water Commissioners for construction of concrete reservoir and foundation of pump house at the water works, to Vaughn & Kibbe, Springfield.

Cloquet, Minn.—Extending water and sewer system, to Pastoret-Lawrence Co., Duluth, $23,398.43.

Kansas City, Mo.—Furnishing about 1,622 tons of c.-i. pipe and 3 5tons of special castings, to U. S. C. I. Pipe and Foundry Co., city; pipe, all sizes, $26.70 per net ton; castings, $65 per ton.

Morehead, N. C.—To the Harris Hardware Co., Washington, N. C., to construct water works; cost about $20,000.

Fargo, N. D.—To James Kennedy for the construction of filtration plant, $98,968, for furnishing pumping engine $11,860, and the boilers and stokers, $8,062.

Cincinnati, O.—By Service Director Sundmaker for laying water mains in Lick Run road and other Westwood streets, to J. J. Brown, $6,429.50.

Oklahoma City, Okla.—Building sedimentation basin at water works, to Hunter & Hunter, city, $12,987.60.

Erie, Pa.—Laying 400 pieces of 6-in. pipe to be used in extension of water mains by Water Commissioners, to the United States Cast Iron Pipe Co., Chicago, $21.75 per ton delivered in Erie; other bids were as follows: American Casting and Foundry Co., Detroit, $24.85; Standard Cast Iron Pipe and Foundry Co., Bristol, Pa., $22.50; Massilon Iron and Steel Co., $24.15.

Zelienople, Pa.—To Martin Swain, city, for the construction of reservoirs and an 8-in. rising main, $8,500.—Douglass & McKnight, 1709 Union Bank Bldg., Pittsburg, Engineers.

Galveston, Tex.—Adding 40 ft. to Alto Loma standpipe, to J. J. Kane, $1,052.

Park City, Utah.—Building water system, to A. A. Clark, Salt Lake City, $47,245.15.

Gleichen, Alta., Can.—Water works and sewers: Contract A, drilling deep well, to Alberta Well Drilling Co., Calgary; B, supply of lap-welded steel pipe, to General Supplies, Ltd., Calgary, for Stewarts & Lloyds; C, gate valves, to Canadian Fairbanks Co., for Alley & McLellan's valves; D, hydrants, to Calgary Ironworks Co., Calgary; E, elevated steel tank, to Des Moines Bridge and Iron Co., Des Moines, Ia.; F, sewer pipe, to Red Wing Sewer Pipe Co., Red Wing, Minn.; G, manhole covers, etc., to London Foundry Co., London, Ont.; work will be done by John Galt Engineering Co., of Winnipeg and Calgary.

Harrison, Ont., Can.—Supplies for water works: Cast iron pipes and special casting, to Gartshore Tomson Pipe and Foundry Co., Ltd., Hamilton, $31.20 per ton for c.-i. pipe and $2.75 per 100 lbs. for special casting; to James Robertson Co., Ltd., for lead $3.06 per 100 lbs. and $14.50 per 100 lbs. for gasket; building water tower, to Hunter Bridge and Boiler Co., Kincardine, $3,505; to Ker Engine Co., Walkerville, $30 each for hydrants, and $2.50 for 10-in. valves, $15 for 8-in. valves, $9 for 6-in. and $5.60 for 4-in. valves.

Welland, Ont., Can.—Furnishing pump and water wheel for the new water works pumping station, to Canadian Boving & Toronto; contract calls for a 3,300,000 horizontal triplex single acting pump developing 250-hp. on a 7-ft. head, $11,900; traveling crane, $400; pump and wheel are slow speed machines; other bidders: John McDougal Co., Montreal, pump and turbine, $14,069; John T. Farmer, Montreal, pump and turbine, $15,250; Goulds Pump Co., Montreal, pump and turbine, $15,250; Smart Turner Machine Co., Hamilton, pump and turbine, $18,500; Wm. Hamilton Mfg. Co., Peterboro, pump and turbine, $14,600; Escher Wys & Co., Toronto, pump and turbine, $14,365; the Canada Foundry Co. and John Inglis Co. tendered for pump only.

BIDS RECEIVED

Fort McKinley, Me.—Construction and installation of a chemical water softening plant of 15,000 gals. capacity: L. M. Booth Co., 116 Liberty st., New York, complete, $6,870; Item (1) $4,800, (2) $550, (3) $970, (4) $550; the Kennicott Co., Chicago Heights, Ill., Item (1) $5,500; American Water Softener Co., 1011 Chestnut st., Philadelphia, Pa., complete, $7,300; Item (1) $4,950; Northern Water Softener Co., Madison, Wis., Item (1) $4,400, (2) $750, (3) $1,300; William Graver Tank Works, Rookery Bldg., Chicago, Item (1) $3,150 and $3,980, (2) $1,260, (3) $2,065; Reisert Automatic Water Purifying Co., 30 Church St., New York, Item (1) $3,475, (2) $285, (3) $485, (2) and (3) 1,064; Gem City Boiler Co., Dayton, O., Item (1) $5,570, (2) $1,770, (3) $3,645, (4) $850; Pittsburg Filter Mfg. Co., Pittsburg, Pa., Item (1) $6,475, (2) $675 and $375, (3) $2,225; Frank H. Marshall, South Portland, Me., Item (4) $439; Felber Engineering Works, Inc., New York, complete, $6,750, not complying with specifications, Item (4) not included in price.

Rahway, N. J.—Installing 5,000,000-gal. pump at water works: Wilson-Snyder Co., Pittsburg, Pa., $21,000; Allis-Chalmers Co., New York, $13,950; Heisler Co., St. Mary's O., $16,195; Cockburn Co., Jersey City, $19,220; Alternate bids, $16,300, and $21,500; Platt Iron Works Co., Dayton, O., $17,900; Epping-Carpenter Co., Pittsburg, Pa., $14,600, and three alternate bids, $13,200, $13,100 and $12,700; Snow Steam Pump Co., Buffalo, $14,335.

Buffalo, N. Y.—Building two tunnels from east side of old pumping station and carried under the New York Central tracks, with extensions to west curb of Front ave.; they are to be of brick and are for discharge mains and new pumps Nos. 3 and 4; Eastern Concrete Steel Co., $22,462; William Franklin, $25,860; B. I. Crooker Co., $26,981; George W. Moore, $27,900; Joseph F. Stabell Co., $29,500; Dark & Co., $29,600; the Commissioner certified the Eastern as the low bidder.

Fargo, N. D.—Construction of filtration plant: F. T. Powers & Co., Fargo, $109,300; James Kennedy, Fargo, $98,970; Pittsburg Filter Co., $115,700; Fargo Plumbing and Heating Co., $130,507; S. Birch & Sons Co., Fargo, $118,000; furnishing the pumping engines, the Fargo Plumbing and Heating Co. had four different bids, for different types of engines as follows: No. 2, $22,325; No. 3, $22,447; No. 4, $21,393; No. 5, $23,922; Platt Iron Co., of Kansas City, Mo., one bid for

$12,650, and same company offered another for vertical expansion engines for $23,000, the former bid being on horizontal type of engines; the Eppington-Carpington Co., horizontal engine for $12,700; James Kennedy, Canton-Hughes with four bearings, $12,300 and $11,860, latter having two bearings; the Murray Iron Works Co., of Minneapolis, horizontal engine for $14,148; Allis-Chalmers Co., Milwaukee, offered vertical engine for $28,000 and one of horizontal type for $12,625; specifications call for pumping engines wth a capacity of 4,000,000 gals. every 24 hours; boilers and stokers, the Robinson, Cary & Sands Co., of St. Paul, three Edgemore horizontal boilers with stokers, $10,460; Detroit Auto Stoker Co., three boilers and stokers, $8,450; James Kennedy, for the same, $8,062; R. B. Whittaker, for the same, $9,965; Minneapolis Steel and Machine Co., for the same, $7,547; the $130,507 bid of Fargo Plumbing and Heating Co. was for complete filtration plant and equipment; specifications call for boilers tested to 150 for continuous use.

Niles, O.—Construction of the Water Filtration plant and clear well, Ensminger Bros., of Columbus, lowest bidders: Purification plant, (a) material, $20,000, (b) labor, $12,900; clear well, (c) material, $4,000 (d) labor, $2,920; total, $30,820; other bidders: W. H. Ralston, Mt. Vernon, purification plant (a) $20,000, (b) $19,000, (c) $3,300, (d) $3,000; total $45,300; Roberts Filter Mfg. Co., Philadelphia, Pa., (a) $20,000, (b) $22,100, (c) $4,000, (d) $3,000; total, 49,100; Pittsburg Filter Mfg. Co., Pittsburg, (a) $17,200, (b) $25,00, (c) $3,600, (d) $3,000; total, $48,800; Niles Lumber Co., Niles, (a) $28,000, (b) $12,000, (c) $4,500, (d) $3,500; total, $42,950; American Water Softener Co., Philadelphia, (a) $28,224, (b) $18,815, (c) $4,048; (d) $2,700; total, $53,787; Louis Adavasio, Youngstown, (a) $26,000, (b) $20,000, (c) $4,000, (d) $3,000; total, $44,501.

Springfield, O.—Laying a force main from the old to new pumping station, Patrick Caffery, lowest bidder, 79c. per ft.; U. S. Cast Iron Pipe and Foundry Co., lowest bidder for supplying 873 tons of 20-in. pipe, $22.45 per ton.

Somerset, Pa.—Construction of a reservoir of concrete construction from plans of L. E. Chapin, Frick Bldg., Pittsburg, to W. G. Ferner, Somerset, $4,191; other bidders on concrete construction were: H. C. Brooke, Uniontown, $5,874; U. S. Construction Co., Columbus, O., $4,431; Somerset Construction Co., Somerset, $6,000, and J. C. McSpadden, Rockwood, $6,077.

LIGHTING AND POWER

Eufaula, Ala.—Council will advertise for bids for erection of municipal light plant for the city on June 7.—W. L. Upton, Birmingham, Consulting Engineer.

Gadsden, Ala.—Franchise has been granted E. T. Hollingsworth, Chas. P. Smith, T. S. Kyle, E. R. LeFevre and John D. Dunlap to operate gas and electric company, using the alleys and streets of city for the pipe line and wires.

Tuscaloosa, Ala.—Tuscaloosa National Gas Co. has asked for franchise to pipe gas into city.—L. H. Maxwell, President.

Palatka, Fla.—F. P. Clark, Jacksonville, has petitioned Council for 30-year franchise to light streets with electricity; plant will cost $40,000 to $50,000.

Nampa, Ida.—L. L. Nurn has been granted franchise to install light, heat and power system; generating plant will be built on Nalad River.

Anderson, Ind.—C. W. Hooven, who controls natural gas franchise in this city, has announced that city will next winter be supplied with artificial gas and that work on gas producers will begin at once.

Fairfield, Ia.—Hall & Adams, Centerville, have been selected as engineers to prepare plans for improvements of electric light plant.

New Market, Ia.—Lee Electric Light Co. Clarinda, has been granted franchise to supply city with light.

State Center, Ia.—Municipal electric light plant has been destroyed by fire.

Burton, Kan.—Installation of gasoline engine and dynamo to supply electric light is being considered.

Nortonville, Ky.—Nortonville Traction Co. will erect electric plant for lighting.—Frank E. Mohr, President.

Kentwood, La.—Town is being surveyed for location of electric light and water works system.

Buchanan, Mich.—Citizens have voted in favor of giving Niles Gas Light Co. franchise to extend mains through village.

Brown Valley, Minn.—Installation of electric light system is being considered.

Delano, Minn.—Preliminary plans will be prepared by Oscar Claussen Engineering Co., St. Paul, for remodeling or building electric light plant.

Duluth, Minn.—Council has passed resolution calling for complete set of specifications, plans and surveys, with detailed statements of cost for the construction and equipment by city of a plant for furnishing electric light, heat and power.

Carthage, Mo.—Empire District Electric Co., M. R. Bump, General Manager, will make improvements.

Bloomfield, N. J.—Installation of municipal lighting plant is being considered.—Jas. E. Brooks, Chairman Lighting Committee.

Seaside Park, N. J.—Borough Council is considering $35,000 expenditure on light, sewer and water plant.

Marion, N. Y.—Public Service Commission, Second District, has authorized the Marion Power Co. to construct and operate electric lighting plant.

Wilmington, N. C.—Tidewater Power Co. is considering installation of one 400-hp. boiler and other machinery at gas plant.

Bowbells, N. D.—National Briquetting Co., Kenmore, has asked Council for franchise to supply light and power.

Velva, N. D.—City has granted franchise to John Moore to build and operate electric light plant for period of 20 years.

Columbus, O.—Council has passed ordinance providing $20,000 bond issue for proposed cluster light system.

Greenspring, O.—Village Council has granted franchise to D. M. Scott to build electric light and power plant.

Oklahoma City, Okla.—Oklahoma Gas and Electric Co. will extend electric light system to Britton at cost of about $20,000.

Madras, Ore.—Council has passed an ordinance authorizing A. E. Hammond to construct and operate electric light and power plant.

Coatesville, Pa.—Town is considering erecting plant for electric street lighting.

Custer, S. D.—Custer Electric Light, Heat and Power Co. has been granted franchise to operate electric plant for a period of 50 years.—Edward L. Grantham, President.

Livingston, Tenn.—W. W. Hendricks. Cookeville, is considering installation of electric light plant.

McAllen, Tex.—Town has granted franchise to A. L. Stang, El Campo, for electric light plant.

Port Lavaca, Tex.—W. E. Shell & Co. are considering construction of electric light plant.

Waxahachie, Tex.—Council has granted franchise to Raymond G. St. John and Henry M. Wallace, of Detroit, Mich., to establish, maintain and operate gas plant.

Danville, Va.—Election on June 27 on $150,000 bonds to improve and extend electric light system is being considered.

Monroe, Wash.—H. H. White, representing Everett Gas Co., has asked Council for franchise to extend the present system from Snohomish to this city.

Berlin, Ont., Can.—Ratepayers will vote May 31 on $20,000 electric light by-law and $7,900 by-laws for stret railway.

South Qu'Appelle, Sask., Can.—Electric Light Co. is considering erecting a more substantial power house, and also installing gasoline power.—L. G. Bell, Secretary-Treasurer Board of Trade.

CONTRACTS AWARDED

Old Orchard, Me.—Furnishing city with 86 60-c.p. tungsten lights, $25 per light per year.

Kansas City, Mo.—By Kansas City Electric Light Co., to Electric Storage Battery Co., Philadelphia, Pa., for installation of storage battery plant at substation, 6th and Wall sts., $100,000.

Rockingham, N. C.—Continuing and completing construction of hydroelectric plant and 100 miles of transmission line, to F. W. Abbott & Co., 90 West st., New York, by Yadkin River Power Co.—Charles E. Johnson, Raleigh, President.

Stoughton, Wis.—Installation of electric light plant on the Yahara River, to the Power Engineering Co., Minneapolis, Minn., about $75,000.

FIRE EQUIPMENT

Los Angeles, Cal.—Council has voted to adopt the report of Supply Committee, recommending purchase of aerial ladder truck, 65 ft. long and motor-driven, for $10,834.

East Hartford, Conn.—Fire District is considering erection of $1,000 addition to house of Volunteer Hose Co.

Coffeyville, Kan.—Board of Insurance Underwriters has recommended purchase of one steamer, one combination hose wagon, installation of modern fire alarm system, erection of additional fire station.

Haverhill, Mass.—Alderman Bean, head of the Fire Department, has been designated as Investigating Committee to look into merits of automobile engine, and also matter of police signal system.

Lawrence, Mass.—Chief D. E. Corey has recommended $4,000 appropriation for fire alarm boxes.

Salem, Mass.—Finance Committee will recommend erection of $6,500 fire house and a flying squadron to cost $5,500.

Salem, Mass.—Chief Engineer Arnold has recommended need of auto apparatus.

Worcester, Mass.—Firemen are urging purchase of more fire apparatus.

Adrian, Mich.—Need of additional hose, hose wagon and other equipment is being urged. Address Mayor Joslin.

Watervliet, Mich.—Council has decided to purchase chemical engine.

Nelson, Neb.—Volunteer fire department has been formed.—M. L. Crossley, Chief.

Omaha, Neb.—Fire Chief Salter has recommended purchase of auto fire engine.

Bloomfield, N. J.—Need of chemical engine is being urged.

Jersey City, N. J.—Fire Chief Dunn has recommended purchase of hook and ladder truck, erection of fire house on Washington st. and early consideration of auto apparatus.

Albany, N. Y.—Board of Contract and Supply will at once ask for bids for construction of an alarm system for the First, Second, Third and Fifth Police Precincts; estimated cost, $27,000.—Isidore Wachsman, Secretary.

Old Forge, N. Y.—Citizens have voted $2,500 to erect engine house and municipal building.

Granite Pass, Ore.—Citizens will vote on bonds for purchase of auto fire engine.

Trappe, Pa.—Purchase of fire engine is being considered by fire company.

Montreal, Que., Can.—Fire Chief Tremblay is urging erection of harbor fire station and purchase of fireboat.

CONTRACTS AWARDED

Lynn, Mass.—By Purchasing Agent Carleton for 500 ft. of double jacket cotton-knit, rubber-lined hose, 65c. per ft, to New Jersey Car Spring and Rubber Co., of Jersey City.

BRIDGES

Jackson, Cal.—County Surveyor Gustave Schroeder has prepared plans for erection of bridge across Jackson Creek.

Nevada City, Cal.—Supervisors have voted to build steel bridge across Wolf Creek at Lime Kiln, on Auburn road; it will have a floor of reinforced concrete.

Milford, Conn.—Selectmen are considering replacing of bridges at east end of Cherry st. and over Tory Brook at Broad st. with concrete structures.

Sanford, Fla.—County Commissioners have asked for bids for erection of $15,000 bridge over St. Johns River.

St. Augustine, Fla.—Council is considering erection of solid concrete bridge over San Sebastian River to New Augustine.

Chicago, Ill.—Plans have been prepared for 4 bascule type bridges to be constructed over river at 5th, Washington, 92d and Indiana sts. at cost of $1,195,000.

Bloomington, Ind.—Monroe County Commissioners have ordered plans on which bids will soon be asked for the construction of overhead bridge at the Monroe crossing of Vernal pike.

Indianapolis, Ind.—County Commissioners have advertised for bids for construction of bridge over Fall Creek, in Capitol ave.; appropriation of $85,000 has been made.

Indianapolis, Ind.—Plans and specifications for reinforced concrete arch bridge across Pleasant Run at State ave. have been adopted by Board of Public Works.

Martinsville, Ind.—Niagara County Commissioners have approved plans for construction of a concrete bridge 450 ft. in length, with 20-ft. roadway, across White River at Waverly; $40,000 available. S. A. Blunk, Engineer.

Mishawaka, Ind.—Wm. S. Moore, City Engineer of South Bend, has prepared plans for $65,000 concrete street bridge of four spans to be erected over St. Joseph River at Logan st. if petition is granted by County Commissioners.

Shell Rock, Ia.—Board of Supervisors has decided to construct a bridge in Dayton Township at a cost of about $5,000.

Kansas City, Kan.—Specifications have been prepared for the viaduct to be constructed over Reynolds ave. at 6th st.

Georgetown, Ky.—Scott County Commissioners will soon ask for bids for constructing seven highway bridges; Prof. Walter E. Rowe, College of Civil Engineering, State University of Kentucky, Lexington, has been employed as Designing and Inspecting Engineer.

Sanford, Me.—Bridge will be erected over Mousam River at River st.—H. E. Perkins, Moderator.

Fulton, N. Y.—Plans for proposed $170,000 steel reinforced concrete bridge over the Oswego River at Broadway have been received by Board of Public Works; plans call for a bridge running from East 1st to West 1st. st., 1,205 ft. in length, with a probable driveway of 34 ft.

Lowville, N. Y.—Town is considering election on $9,000 bonds to construct concrete culvert across Mill Creek.

Washington, Pa.—Grand Jury has approved of construction of following bridges: Over Pigeon Creek in the Borough of Monongahela City with a span of 110 ft., at estimated cost of $18,000; bridge of 60-ft. span over the waters of Pigeon Creek in Borough of Bentleyville, $5,313; over Brush Run in Peters Township at Thompsonville, with 44-ft. span; over Brush Run in Independence and Hopewell Townships near David Barr farm, with a 40-ft. span, $4,015; over Peters Creek in the Borough of Finleyville, with 50-ft. span, $4,445.10; Sparta bridge in Morris Township over Short Creek, with 18-ft. span, $387.71.

Richmond, Va.—Board of Supervisors of Henrico and Hanover Counties are considering erection of bridge over Chickahominy River at Creighton road.

Spottsylvania, Va.—Spottsylvania County is considering construction of reinforced concrete and steel structural bridge across Po River at Snell.

CONTRACTS AWARDED

Bloomfield, Ind.—Constructing three bridges, to the Vincennes Bridge Co., Vincennes, Ind.

Bloomfield, N. J.—Building concrete and steel bridge over Third River and Morris Canal, at Baldwin st., to Linde & Griffith, Newark, $12,995.

Chester, Pa.—Repairing four county bridges, to C. L. Franklin, Darby, about $1,200.

Ebensburg, Pa.—By County Commissioners for the erection of bridges across Brubaker Creek, in Elder Township, to Polo Azzara, $1,975, and at Portage, crossing Trout Creek, to Ashley J. Lord, $2,300.

Richmond, Va.—Building Mayo bridge, to I. J. Smith & Co., $224,734; Belgian block paving of roadbed, $8,000; approaches according to the "yellow line" or modified grade, $21,000; supervision and inspection, $4,200; testing material, $3,000.

BIDS RECEIVED

Passaic, N. J.—Constructing the drawbridge which is to span Passaic River at Rutherford ave. to the Bergen County side, Walter J. Harris, lowest bidder, $60,375; other bidders: Stillman-Delehanty-Ferris Co., $62,280; Pennsylvania Steel Co., $73,140; F. W. Schwiers, Jr., $67,749; Long & Miller, $84,255; Snare & Triest Co., $72,480; Northeastern Construction Co., $77,983; Oswego Bridge Co., $71,490; F. R. Long & Co., $67,720; Oscar Daniels, $87,000.

Philadelphia, Pa.—Widening Chestnut st. bridge over the Schuylkill River; M. & J. B. McHugh, $74,084; Oswego Bridge Co., $76,096; American Paving and Construction Co., $77,519; Strabel Steel Construction Co., $88,805; Richard Walsh, $97,868; all bidders agreed to complete the work in 10 months; building double track steel plate girder bridge, with grading and paving of streets, on the line of Springfield ave. under Philadelphia and Baltimore Central Railroad, Denorte Delise, eight months, $32,874; William P. Mahoney, four months, $33,216; P. F. Reilly, five months, $33,314; McNichol Paving and Construction Co., five months, $37,891; American Paving Co., 10 months, $39,765; there were 13 bidders altogether, of which W. S. P. Shields was high at $40,477; Shields was low bidder on rip-rapping, and other fender work on Passyunk ave. bridge piers, $5,608.88; other bidders were American Paving and Construction Co., $7,260, and Armstrong & Latta Co., $7,537.

Fairmount, W. Va.—Building 4th st. bridge, Nelson-Merydith Co., Pittsburg, Pa., plan A $12,187, plan B $12,798, plan C, $15,198, plan D, $11,548, Plan E1 $6,822, plan E2 $6,375, plan E3 $6,471, plan E4, $6,122, plan F, $11,241; American Bridge Co., New York, $5,710; Robert H. Morfitt, Jr., Harrisburg, Pa., reinforced concrete, $12,096; McClintic-Marshall Construction Co., Pittsburg, Pa., $10,513; Faris Bridge Co., Pittsburg, Pa., $6,985; difference in the prices is caused from fact that some companies gave bids for complete bridges, others for bridges without the floors completed, some for steel and some for reinforced concrete structures.

MISCELLANEOUS

Berkeley, Cal.—Citizens have defeated proposed $1,000,000 bond issue for improvements.

Palo Alto, Cal.—Bids will be received May 22 for purchase of bonds to be used for the construction of a garbage crematory and auxiliary pumping plant.—J. F. Byxbee, Jr., City Engineer.

Redwood City, Col.—Trustees have accepted plans for erection of $12,000 town hall; exterior plans will be prepared by E. P. Antonovich, 333 Kearny st., San Francisco, and interior plans by T. M. Edwards, San Mateo.

Washington, D. C.—District will handle street cleaning without contractors after July 1; Street Cleaning Department will have about $220,000 to spend next year.—J. W. Paxton, Superintendent.

St. Petersburg, Fla.—Citizens will vote June 13 on $15,000 bonds for improving Lake Park and $5,000 for purchase and improvement of water front lots.

Moscow, Ida.—Stritesky & Rooney, Empire State Bldg., Spokane, Wash., have prepared plans for erection of $150,000 jail and court house for Latam County.

Richmond, Ind.—Drawings have been prepared by Architect F. S. Kaufman for addition to county jail.

Council Grove, Kan.—Modern jail will be erected.

Brooksville, Ky.—Hernando County will erect $40,000 court house.

New Orleans, La.—Board of Liquidation of City Debt has sold $7,000,000 bonds for public improvements.

Mason, Mich.—Plans by Architects White & Butterworth, Lansing, have been accepted and bids will soon be asked for erection of addition to county poor house.

Duluth, Minn.—Council has authorized the Board of Public Works and the City Engineer to purchase auto for their combined use at cost of $1.800.

Hibbings, Minn.—Bids will be at once asked for furnishing sanitary dump wagon.

St. Paul, Minn.—City Engineer Claussen will soon ask Council to purchase pressure street flushing machines.

McAlester, Mo.—Pittsburg County Commissioners are considering $150,000 bond issue for erection of jail and court house.

Garwood, N. J.—Bids have been rejected for erection of $12,000 borough hall; plans will be revised and new bids asked.

Trenton, N. J.—Bids will be received May 23, 2 p. m., for $50,000 harbor improvement bonds.—H. E. Evans, City Treasurer.

Woodbine, N. J.—Borough has voted $6,000 bonds for improvements.

Buffalo, N. Y.—Mayor Fuhrmann has signed bill authorizing city to issue $100,000 bonds for playground purposes.

Buffalo,, N. Y.—Board of Park Commissioners will expend $100,000 in buildings and improvements at the Zoo.

New York, N. Y.—Plans have been filed by Department of Parks, T. E. Videto, Architect, for erection of $10,000 comfort station on Worth st.

New York, N. Y.—Board of Estimate has appropriated $10,000 to Street Cleaning Department, Wm. Edwards, Commissioner, for purchase of hose and hose carts for use in new street flushing work.

Old Forge, N. Y.—Citizens have voted $2,500 to erect municipal building and engine house.

Youngstown, O.—Fully $10,000 will be expended by Park Commission in beautifying local parks this spring.

Guthrie, Okla.—Citizens have voted $100,000 bonds for improvements at Mineral Wells Park.

Beaver, Pa.—Citizens will vote June 17 on bonds for erection of borough hall.

Westerly, R. I.—Town will issue $100,000 bonds for erection of town hall.

Humboldt, Tenn.—Citizens will vote on $15,000 bonds to erect city hall.

Nashville, Tenn.—C. K. Colley, city, has prepared plans for erection of proposed public market.

Colville, Wash.—Jones & Levesque, Mohawk Bldg., Spokane, have prepared plans for erection of $35,000 city market.

CONTRACTS AWARDED

Louisville, Ky.—By Board of Public Safety, to Oldsmobile Co., Lansing, Mich., for delivery of a motor patrol chassis to Central Police Station, to be used with motor patrol already in service; cost $1,900; body of car will be built in Louisville; total cost about $3,000.

Falmouth, Mass.—Erecting addition to town hall, to Chas. E. Robbins, $3,774.

Eveleth, Minn.—Hauling city garbage for one year, to J. Smolki, summer months, $283.35; winter months, $215 per month.

Hibbing, Minn.—Furnishing garbage cans, to Thourin Hardware Co., city, 1,000 20-gal. cans, $2.25 each and 150 30-gal. cans, $2.75 each.

Great Falls, Mont.—Furnishing 2,000 ft. of hose for use on boulevards, to Strain Bros. 750 ft., to Murphy-Maclay 750 ft. and Northern Hardware Co. 500 ft.

Orange, N. J.—Scavenger contract, three years, to John N. Lohman & Co., $16,266.66 per year.

New York, N. Y.—Repairs to the steamer Massasoit, to Waters-Colves Co., West New Brighton, S. I., $14,938; other bidders: John W. Sullivan Co., $15,200; James Shewan & Son, $15,374; James Tregarthen & Son, $15,500; John F. Walsh, Jr. & Co., $15,970.

Syracuse, N. Y.—Completing municipal bath house; carpenter and mason work to Miller, Raleigh & Co., $3,200.

Whitesboro, N. Y.—Sprinkling and sweeping paved streets for two years, to Utica Sweeping and Contracting Co., Utica.

Youngstown, O.—Building comfort stations in Lincoln and South Side Parks, to Thompson & Frame, $672, and Arthur Chesney, $790.

BIDS RECEIVED

Los Angeles, Cal.—Furnishing county with auto for highway repair work: R. C. Hamlin, Franklin motor truck, $2,550; Whiting & Mead, Johnson, $2,150; Pioneer Commercial Auto Co., Randolph, $2.100, or a Rapid at $2,950; Lord Motor Car Co., Garford, $2,500; C. C. Henion, Standard, $3,000; Hawley, King & Co., Grabowsky, $2,450, or a Clark at $1,750; M. S. Bulkley & Co., Autocar, $2,525.

Waycross, Ga.—Building county jail: Paully Jail Co., brick, $34,194.50; concrete, $35,467.43; South Eastern Jail Co., brick, $34,985; concrete, $37,069; Park Mor Ran Co., concrete, $34,984; brick, $33,995.50.

Boston, Mass.—Construction of wood or steel ferryboat for East Boston service; steel construction, Maryland Steel Co., $155,000, and W. & A. Fletcher Co. bidding $129,950; wood construction, Bertelsen & Peterson Engineering Co., $117,000, the boat to be finished in 11 months; Atlantic Works, $121,450, boat to be finished in 7 months; William McKie's bid was $120,750, boat to be finished in 7 months, and W. & A. Fletcher Co., $127,450, to be finished in 8 months.

Boston, Mass.—Disposal of garbage and refuse for city districts of West Roxbury and East Boston excluded: Daniel P. Sullivan, formerly Superintendent of Sanitary Department, disposing of garbage, $27,400 less than price the city is now paying New England Sanitary Disposal Co.; offer for garbage is $24,995, and for refuse 44 9-10c. per ton; by this proposition city furnishes stations and does all work of carting; Jeremiah P. O'Riorden, Charlestown, will dispose of the garbage and waste and furnish all the scows necessary for the harbor work for $197,000 first year; for each succeeding year of the nine remaining years he seeks an increase of 2 1-10 per cent over cost of the year preceding; Boston Disposal Co., $234,940 a year with 2 1-10 per cent increase each year, as in case of O'Riorden; the Vulcan Incinerating Co., of New York, would build plant in Brighton with capacity of 18,000 tons daily, the cost of plant to be $72,500, the same at the expense of city, and for disposing of garbage would charge 66 2-3c. a ton of 2,000 lbs.; another bid of the company was that of disposing of garbage and waste in Districts 1, 6, 7, 8, 9 and 10, about 316,000 tons annually, at rate of 66 2-3c. per ton; company would erect a station at Cow Pasture or on Deer Island at cost to city of $276,000; Frank P. Neelon & Co. offered to dispose of garbage and waste at annual cost of $189,000, city to erect and maintain collection stations; Joseph Marrone, of New York, offered to dispose of the garbage for 52c. a ton, or to do the work on ten-year contract for $200,000 first year and increase of 2 per cent a year for remaining years; four propositions were contained in the bid of the Boston Development and Sanitary Co., submitted by William F. Donovan, President; first proposition provides for three water-front and two inland stations; the price for disposal would be $184,000 the first year and 3 per cent increase each year; second proposition provides for three water-front and three inland stations; cost would be $210,000 per year, plus 3 per cent yearly over the figure of the preceding year; third proposition provides for three water-front and two inland stations; in addition the company would furnish dump for ashes in swamp lands of New Haven road on the South Bay; price for disposal the first year would be $200,000 plus the yearly increase of 3 per cent; fourth proposition provides for three water-front and three inland stations; dump for ashes is also included; price is $220,000 a year, plus the yearly addition of 3 per cent.

New York, N. Y.—By Park Board, constructing Bushwick playground, bounded by Putnam ave. and Woodbine st. extension, between Knickerbocker ave. and Irving ave., Kelly & Kelley, 45 East 42d st., lowest bidder, $23,234.

New York, N. Y.—Installing fire protection system and compressed air line on Manhattan Bridge over East River, between Manhattan and Brooklyn, as follows: Vulcan Rail and Construction Co., $20,742; McHarg-Barton Co., $22,200; M. J. O'Brien $29,495; Oscar Daniels Co., $24,900; A. Kaufman, $28,000.

Spokane, Wash.—Furnishing three asphalt dump wagons for Street Department: J. I. Case Threshing Machine Co., $200 each; Polson Implement Co., three for $642; McGowan Bros. Hardware Co., three makes at $180, $193 and $200 each; E. P. Jamieson & Co., $209 each; T. J. Coffman Co., $190 each.

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			STREET IMPROVEMENTS	
Minnesota	Duluth	May 19, 10 a.m.	Grad., pav., re-pav. and otherwise improving var. streets	Olof G. Olson, Pres, Bd. Pub. Wks.
Virginia	Amherst	May 29, 11 a.m.	Constr. about 4½ miles of macadam road, alternate bids with County owning 5,000 cu. yds. stone and a 10-ton roller and sprinkler and contractor furn. roller and sprinkler	P. St. J. Wilson, St. Hwy. Comr.
Indiana	Indianapolis	June 6, 11:30 a.m.	Constr. stone and gravel roads in Harrison & Sugar Ridge twp.	Edgar A. Staggs, Audr. Clay County
Pennsylvania	Sharon	June 6, 5 p.m.	Paving about 1,900 sq. yds. on Oakland ave.	Oscar J. Denny, Boro. Secy.
Indiana	Kokomo	June 6	Constr. about 9 mi. of gravel road in Jackson & Liberty twps.	A. B. Easterling, County Auditor.
Indiana	Rushville	June 6	Constr. 6,659 ft. of macadam road in Jackson twp.; and 7,523 ft. of macadam road in Posey and Jackson twps.	Jesse M. Stone, County Auditor.
Indiana	Vincennes	June 6	Constr. 2 gravel roads in Busseron twp., in all 11,600 ft. long; and a gravel road in Vincennes twp. 2,295 ft. long	County Commissioners.
Pennsylvania	M'Donald	May 20	Paving various streets	O'Dell Allison, Boro. Clerk.
			SEWERAGE	
New Jersey	Summit	May 20, 2 to 2:30 p.m	Constr. 1,500 lin. ft. vit. pipe sanitary and storm sewer, for the Summit Estates Company	John S. Stiger, Chief Engr.
West Virginia	Hamilton	June 10, 1 p.m.	Constructing sewers in various streets, size 12 to 18-in.	A. B. Maupin, City Engr.
			WATER SUPPLY	
Minnesota	Lake City	May 25, 8 p.m.	Laying water pipes, hydrants, gates, etc.	H. F. Jones, Pres. Bd. W. & Lt. Com.
Connecticut	Waterbury	May 30, 8 p.m.	Stripping of surface soil from the basin of Morris Reservoir in the towns of Morris and Litchfield	R. A. Cairns, City Engr.
Ontario Can.	Ridgetown	June 1	Laying water pipe, castings, hydrants, valves, etc. and constructing a steel elevated tank	D. Cochrane, Town Clerk.
North Dakota	Mandan	June 2	Improving water works	Lee Nichols, City Auditor.
Alabama	Ft. Morgan	June 2	Furn. a motor driven deep well pump, elec. trans. line, 4-in. cast iron water main, etc.	Lieut. E. F. Barlow, Con. Q. M.
			LIGHTING AND POWER	
Ohio	Cincinnati	May 26, noon	Lay. gas mains and interior pipe fitting required at Branch Hos.	Edw'd P. Durr, Secy. Dept. P. S.
			BRIDGES	
Ohio	Niles	May 29, 1 p.m.	Constructing the superstructure of a bridge Farmington twp.	Fred T. Stone, County Auditor.
Pennsylvania	Pittsburg	May 31, noon	Constr. 2 elliptical arch reinforced concrete stone faced bridges and 1 reinforced concrete semi-circular arch bridge	R. J. Cunningham, County Comp.
Kansas	Garland	June 6, noon	Constr. either a steel or conc. bridge across Drywood Creek	Fred G. Schwartz, County Clerk.
Indiana	Indianapolis	June 12, 10 a.m.	Constr. a bridge over Fall Creek, on Capitol ave.	Albert Sahm, County Auditor.
			MISCELLANEOUS	
Minnesota	Duluth	May 19, 10 a.m.	Furn. one 5-passenger automobile 40 to 60 H. P.; also one 3 or 4 passenger runabout	Olof G. Olson, Pres. Bd. Pub. Wks.
Pennsylvania	Wilkes Barre	May 22, noon	Furn. one 35-in. horse lawn plower with shafts and seat	Wilkes Barre Park Comn.
Kentucky	Middlesboro	May 24, noon	Constr. a city building, courthouse, jail and fire department	Mayor.
Ohio	Cincinnati	May 25, noon	Furn. one automobile run about with rumble seat	John J. Wenner, Clk. Dept. P. S.

STREET IMPROVEMENTS

Sacramento, Cal.—County Supervisors are considering petition for road in eastern part of the Haggin Grant.

Summerville, Ga.—Bids will be received June 1, noon, for $45,000 bonds for street improvements.

Morocco, Ind.—Jackson Township has voted to build extensive system of stone roads.

Fairfield, Ia.—Hall and Adams, Centerville, have been selected as engineers to prepare plans for about 3 miles of street pavements.

Nevada City, Cal.—Supervisors have decided to ask bids for building piece of road along Cherry Creek at cost of $2,000.

Lexington, Ky.—Bids will be readvertised for construction of Clay, Ashland, Columbia and other avenues with macadam; West 3d st. will be resurfaced with sheet asphalt from Jefferson to Henry.

Springport, Mich.—Village Council has $800 available for graveling and improving road leading to Duck Lake.

Bemidji, Minn.—Citizens will vote May 31 on $20,000 bonds for paving streets.

Fremont, Neb.—Cost of paving portion of H st. has been estimated at $12,500.

Atlantic City, N. J.—State Road Commissioner Stevens has given approval to widening of roadway out of May's Landing to Cape May, at dangerous points, and also for its rebuilding.

Clinton, N. J.—Public road from Lebanon to this town is to be macadamized this year.

Trenton, N. J.—Ordinances will be prepared for paving North Stockton st. with asphalt and North Willow st. with vitr. brick.

Binghamton, N. Y.—Citizens will vote June 9 on $10,000 bonds for laying proposed brick pavement on Main st.

Franklin, Pa.—Council has decided to repave Liberty st.

Mauch Chunk, Pa.—Carbon County Commissioners will build road from Fairview, via White Haven, to Freeland and Hazleton, to cost $195,000.

Paterson Heights, Pa.—Council is considering macadamizing of Darlington road.

Washington, Pa.—Washington County Grand Jury has approved nine sections of road to be improved with brick.

Beaumont, Tex.—County Commissioners are considering $5,000 expenditure on proposed county road to Mansfield Ferry.

Fort Worth, Tex.—City Commission has adopted resolution for paving Daggett st. from Summit ave. to South Main st.

McKinney, Tex.—Celina Precinct will vote on $125,000 bonds for good roads purposes.

Troup, Tex.—Citizens of that portion of Cherokee County lying east of Mud Creek and composing one of the commissioner's precincts of county are agitating question of bond issue for the construction and repair of public roads of precinct.

Waco, Tex.—County Commissioners will consider calling election June 20 on $600,000 bonds to build good roads in McLennan County.

Danville, Va.—Citizens will vote June 27 on $150,000 bonds to pave North Warren st. and improve electric light.

Farmville, Va.—South Main st. will be improved at cost of $5,000.

Richmond, Va.—State Commissioner of Highways P. St. Julian Wilson has announced apportionment of State good roads fund: Warwick County will receive $1,124.81; Elizabeth City, $3,093.23; York, $788.85; Isle of Wight, $2,000; Nansemond, $4,132, and James City, $538.

Tacoma, Wash.—City Commission has adopted resolution providing for improvement of Portland ave. by grading and planking and South Twenty-fifth st., East C and East D sts. by paving with sandstone and brick.

Ashland, Wis.—County Board has passed resolution which will place at disposal of County Highway Commissioner $13,700 for building a county road from Ashland to Price County.

CONTRACTS AWARDED

Oakland, Cal.—Paving 7th st., by Southern Pacific Co., to Oakland Paving Co.

Redondo Beach, Cal.—By City Trustees. to Fiachilds-Gilmore-Wilton Co., Los Angeles, for paving Pacific ave. from the southerly city limits to its junction with Benita ave.; paving will be of asphalt concrete.

Detroit, Mich.—Paving with cedar block portions of Waterloo st., Cantor and Iroquois ave., to J. S. Affeld, 761 Campbell ave., $31,340.

Danville, Pa.—Paving East Front and Bloom sts., to Coryell Construction Co.; curbing, to T. L. Evans Sons.

Springdale, Pa.—Grading 30,000 cubic yards. Thoney Pietro. Morgantown, W. Va., $10,500; work also includes building of sewer and water mains at a total cost of $100,000.

Washington, Pa.—Construction of three Washington County roads that are to be improved with brick; to the Donora Construction Co., Charleroi-Bentleyville road, $31,808.20, not including furnishing of the brick; road is to be three miles in length; to John F. Howley & Co., Pittsburg, to build the Prosperity-Dunns Station road and McDonald-Venice road, $23,671.50 and $11,612.06, without the brick; former road is two miles in length, extending from Prosperity towards Dunns Station; latter road is one mile in length, extending from the McDonald borough line; furnishing brick, to the United Fire Brick Co., Uniontown, two miles of Charleroi-Bentleyville road, $15.50 per 1,000, or 65c. per sq. yd.; remaining one mile will be furnished by J. M. Porter, a highway block, $17.25 per 1,000 or 58.65c. per sq. yd.; also highway block for the McDonald-Venice road, $16 per 1,000 or 54.4c. per sq. yd.; Waynesburg Brick Co. is the lowest bidder on Prosperity-Dunns Station road, but the contract has not yet been let.

Houston, Tex.—To Horton & Horton, city, to pave Washington ave., $11,159.

Racine, Wis.—Paving Erie st., to White Construction Co., Milwaukee, $1.89 per yd. for asphalt and 55c. per ft. for curb and gutter.

BIDS RECEIVED

Jacksonville, Fla.—Laying total of 167,767 square yards of vitrified brick pavement on various streets of the city and involving approximate expenditure of $325,000: Engineering & Paving Co., Jacksonville, was lowest in its bids on 71,855 square yards, prices ranging from $1.55 to $1.75, while Georgia Engineering Co., Augusta, Ga., came within figures on 59,110 square yards, prices $1.60 to $1.74; the Graves-Matthews Paving Co., Birmingham, Ala., on 22,827 square yards, prices $1.65 to $1.73, and Alabama Paving Co., Birmingham, on 13,973 square yards, prices, $1.61 to $1.67; 5c. is allowed for maintenance.

Duluth, Minn.—Furnishing a gyratory rock crusher, which will be installed at the Point of Rocks, near Thirteenth ave. West and Superior st.: The Austin-Western Co. bid $1,047, $1,342 and $1,650, and G. E. Ingersoll, $1,630, $1,825 and $2,037, according to kind.

Altoona, Pa.—Resurfacing paved streets: Duster Paving Company, of Tarentum--

Removing old paving, per sq. yd., 20c.; asphalt block, as specified, per sq. yd., $1.65; 3-in. asphalt block, per sq. yd., $1.86 and $1.88; repairs during guaranteed period, 50, 33, 25 and 25 per cent.; The Standard Bitulithic Company, of New York—Removing old paving, 20c. per sq. yd.; for bitulithic block, per sq. yd., $1.35; repairs during guaranteed period, 50, 33, 25 and 25 per cent.; The Barber Asphalt Company, of New York—Removing old paving, 10c. per sq. yd.; for paving, per sq. yd., $1.27; for repairs during guaranteed period, 45, 30, 20 and 20 per cent.; in presenting its bid the Barber people said it was understood that it was for all work, aggregating 50,000 sq. yds.; The Monroe Paving Company, of New York—Bituminous concrete, per sq. yd., with binder, $1.06; without binder, 83c.; for repairs during guaranteed period, 40, 30, 25 and 25 per cent.; The W. P. McElhany Company, of Pittsburg—Removing old paving, 23c. per sq. yd.; for asphalt block, according to specifications, $1.65 per sq. yd.; for 3-in. asphalt blocks, $1.86; for repairs during guaranteed period, 50, 33, 25 and 25 per cent.

SEWERAGE

Summerville, Ga.—Bids will be received June 1, noon, for $30,000 bonds for sewer and water extension.

Toccoa, Ga.—Time for letting contracts for proposed sewerage system has been extended to June 20.—D. E. Hogsed, Chairman, Sewerage Committee.

Libby, Mont.—Council is considering election on $15,000 bonds to install sewer system.

Palmyra, N. J.—Installation of sewer system is being considered.

Ashland, Wis.—Board of Public Works will at once ask bids for construction of sewers.—City Comptroller Dillon, Chairman.

CONTRACTS AWARDED

Dallas, Tex.—Building storm sewer on South Harwood st., Jackson and First sts., to Dallas Lime & Gravel Co., $13,089.59.

Springdale, Pa.—Building sewers to Thoney Pietro, Morgantown, W. Va.: 470 lineal feet. 20-inch pipe sewer, $1.49; 1,170 lineal feet 18-inch, $1.195; 970 lineal feet 15-inch, $1.11; 9,640 lineal feet 12-inch, 80c.; 10,530 lineal feet 10-inch, 77c.; 13,880 lineal feet 8-inch, 73c.; 83 manholes, $39.50; 28 lampholes, $10; 5 flush tanks, $75, and 60 cubic yards concrete embankment, $10.

WATER SUPPLY

Summerville, Ga.—Bids will be received June 1, noon, for $30,000 bonds for water and sewer extension.

Marquette, Mich.—Citizens have voted $75,000 bonds to extend water works intake pipe additional 3,000 feet into Lake Superior.

Trenton, N. J.—George A. Johnson has been selected by Water Board to prepare at once plans for chloride purifier for this city; the idea of the board is to have the plant placed at the pumping station.

Trenton, N. J.—Judge Rellstab has decided that United States government might proceed at once to condemn the lands desired by it in Essex, Hudson and Bergen counties for the purpose of laying pipes to carry New Jersey potable water to fortifications at the Narrows, in New York Harbor, especially those in Richmond Borough. Government has contract with Hudson Water Co., which is in hands of a receiver.

Salt Lake City, Utah.—County Commissioners have decided to install pump near county reservoir.

Tacoma, Wash.—City Commission has adopted ordinance providing for construction of water mains in Dist. No. 573.

CONTRACTS AWARDED

Springdale, Pa.—Building reservoir and water mains to Thoney Pietro, Morgantown, W. Va.: 1,900 cubic yards reservoir excavation, $2.75; 850 square yards reservoir lining, $3; 50 lineal feet 8-inch cast-iron cleansing pipe, $3; 300 lineal feet 8-inch T. C. overflow drain, $1.00; 400 lineal feet reservoir fence, $1.00; 7,710 lineal feet 10-inch water line, $1.02; 5,780 lineal feet 8-inch, 83c.; 14,730 lineal feet 6-inch, 64c.; 7,440 lineal feet 4-inch, 49c.; 40 fire hydrants, $30.

Salt Lake City, Utah.—Installation of centrifugal pump to Fairbanks-Morse Co., $645.

LIGHTING AND POWER

Gravette, Ark.—Harry V. Forest, of Kansas City, has made a proposition to Council for the purchase of lighting plant.

Tucumcari, N. M.—Tucumcari Electric Light Co. is planning improvements to cost $10,000.

Haddonfield, N. J.—Installation of municipal electric light plant is being considered; cost about $40,000.

Danville, Va.—Citizens will vote June 27 on $150,000 bonds to improve electric light plant and pave North Warren st.

CONTRACTS AWARDED

Wheeling, W. Va.—Work in connection with changing present gas works to water gas plant, removing upper retort and erecting new building, to Bushon & Leham, $10,109; furnishing water-gas apparatus, consisting of 8-ft. 6-in. sets, cast-iron floor, condenser, elevator and oil tank, to Union Gas Improvement Co., Philadelphia, $25,393; furnishing pumps to M. T. Davidson & Co., New York, $185 for iron pumps and $200 for brass; two of each kind will be used.

FIRE EQUIPMENT

Catlettsburg, Ky.—City will erect fire house and city building at Main St. and Broadway.

Virginia, Minn.—Fire Commissioner has rejected all bids for remodeling Fire Hall No. 1 and will do work by day labor.

CONTRACT AWARDED

Virginia, Minn.—Furnishing auto fire truck to Waterous Engine Works, St. Paul, $5,500.

BRIDGES

Lawrence, Mass.—City Engineer Marble will prepare plans for proposed White Pups bridge.

Fort Worth, Tex.—Plans, specifications and bids for a 90-foot bridge of reinforced concrete that is to span Marine creek at Twenty-third st. will soon be advertised for by County Commissioners of Tarrant County.

Spokane, Wash.—Bids will be received June 15, noon, for $415,000 bridge bond issue.—Jas. McGougan, City Auditor.

MISCELLANEOUS

Greenville, Ala.—Erection of jail is being considered.

Catlettsburg, Ky.—City will erect city building and fire house at Main st. and Broadway.

Duluth, Minn.—Health Department is asking for auto trucks for garbage collection.

Syracuse, N. Y.—Resolution asking Board of Contract and Supply to advertise for bids to excavate with steam shovels more than 125,000 cubic yards of earth at Lincoln and Onondaga parks has been passed by the Syracuse Park Commission; commission also decided to buy apparatus for Lincoln School playgrounds, including swings, ladders, horizontal bars, toboggan slides and giant strides.

CONTRACTS AWARDED

Boston, Mass.—To William McKie, East Boston, for double-screw ferryboat for city, $120,750.

Duluth, Minn.—Rebuilding old Quebec pier at foot of Becker Ave. to Interstate Dredge & Dock Company, $5,896.98.

INDUSTRIAL NEWS

(*Continued from page 726*)

Jamestown Block.—William A. Howell, engineer of the street department of the Board of Works, Newark, N. J., visited Jamestown, N. Y., the latter part of last week to make an inspection at first hand of a type of brick pavement known as Jamestown block, which has been mentioned recently in connection with prospective paving contracts. He found that the block had been in extensive use in Jamestown and that it had given excellent satisfaction there. At the plant where it is manufactured he was informed that the demand for it had been so great that largely increased facilities were being provided. Certain features of the process used in making the blocks were interesting and out of the ordinary, Mr. Howell says. There was a brick-cutting machine which was "almost human," he expressed it.

"One special advantage which is claimed for the Jamestown block," Mr. Howell is reported as saying, "is its evenness of quality. This claim appeared to be substantiated by the results of the long service it has given in the Jamestown streets. It has not worn down in patches, as in streets where the quality of the pavement does not run even. Of course it has not had the volume of traffic it would in our busier streets."

Testing Wells.—Tests of the artesian wells, sunk at Mishawauka for the city's water supply were made last week under the direction of Consulting Engineer Dabney H. Maury and Water Works Superintendent C. F. Crabill. There are five wells, varying from 200 to 300 feet deep, and the water rises to within 6 feet of the surface. Harris Air Pumps have been installed. Engineer Maury, after the first test, stated that the wells were doing better than 2,000,000 gallons in 24 hours. Mr. Maury also stated that in nearly every test he had ever attended the first day was marked by breakdowns of some character, but on this occasion none occurred.

Consulting Engineer.—P. R. Moses, consulting engineer, 366 Fifth Avenue, New York City, who specializes in the handling of industrial equipments, announces that the following engineers have been added to his staff: John Fallon, Industrial Engineer, recently Mechanical Engineer of the Tennessee Copper Company, and Stanley G. Flagg & Company; Arthur V. Farr, M. E. Textile Engineer, formerly Szepesi & Farr, 90 West Street; Alfonse Kaufman, E. E., formerly Manager and Chief Engineer Alaska Chemical Company, and associated with Charles B. Jacobs Industrial Laboratories; J. N. Walton, recently Power Engineer and Storage Battery Expert, Brooklyn Edison Company.

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